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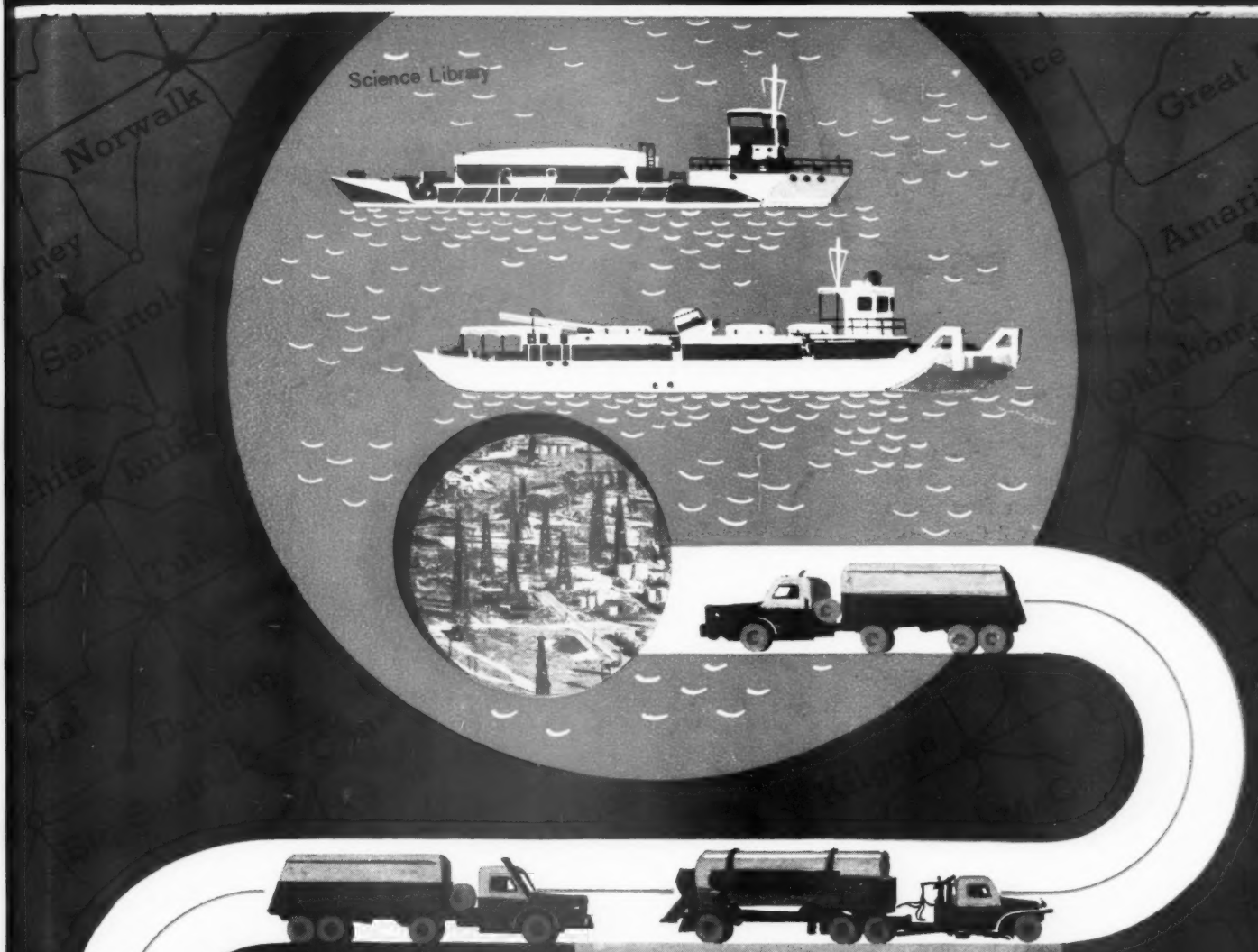


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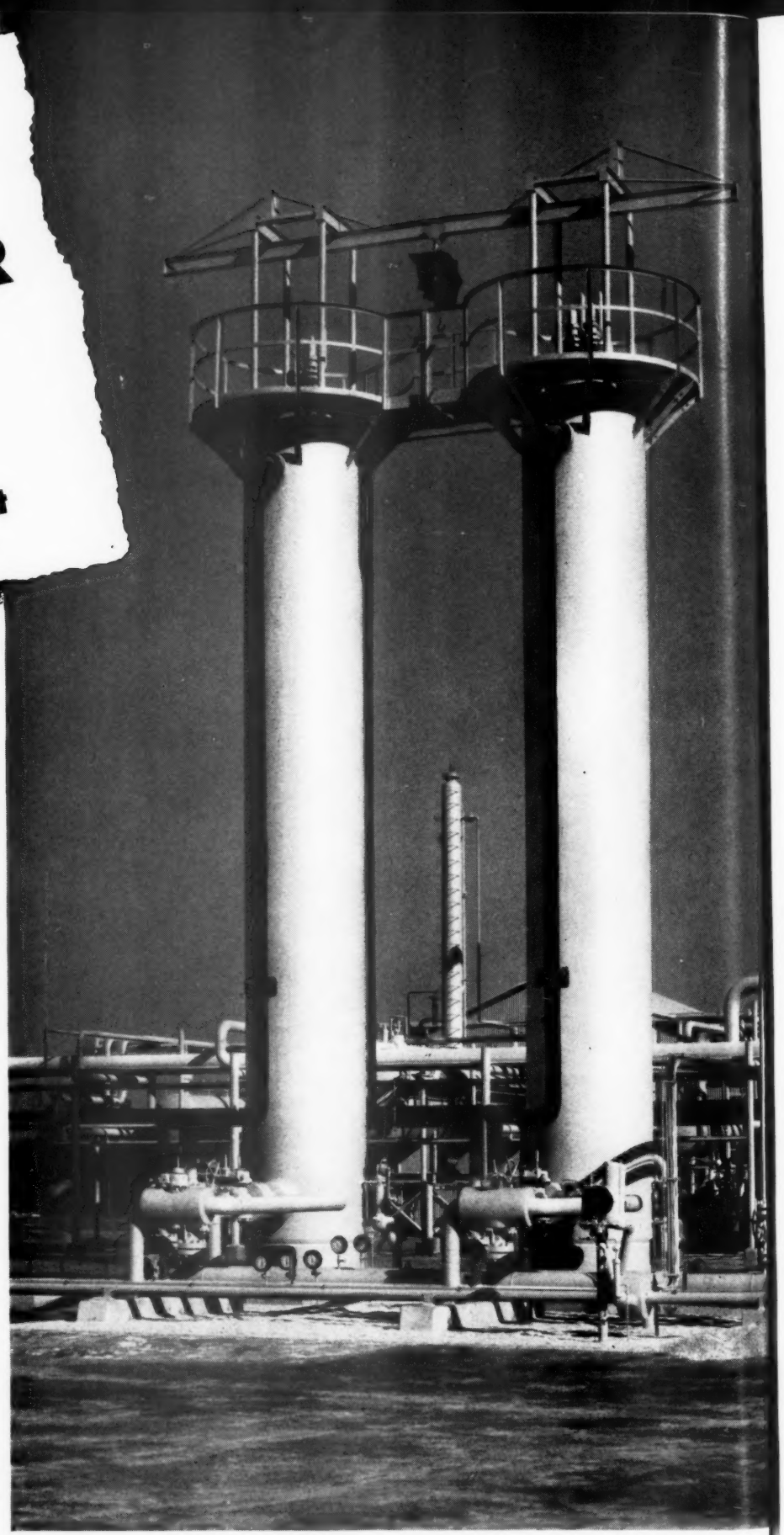

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# the Petroleum Engineer

JULY • 1948

VOLUME XIX NUMBER 11


*...ds for Operating Men*

## MEETINGS

Aug. 9—Nomads, The Houston Club, Houston, Texas.
Aug. 11—Nomads, Jonathan Club, Los Angeles, Calif.
Aug. 30-Sept. 1—Interstate Oil Compact Commission, Roosevelt Hotel, New York City.
Aug. 30-Sept. 1—Appalachian Gas Measurement Short Course, West Virginia University School of Mines, Morgantown, N. Y.
Sept. 1-2—Oil Industry Information Committee, Minneapolis, Minn.
Sept. 6—Nomads, Louis Sherry's, 50th Street and Park Avenue, New York City.
Sept. 6-10—ACS, Petroleum Division, fall meeting, St. Louis, Mo.
Sept. 7-9—SAE, Tractor and Diesel Division, Schroeder Hotel, Milwaukee, Wis.
Sept. 9-11—Compressed Gas Mfrs Assn, Canadian Sec, Manor Richelieu, Murray Bay, Quebec, Canada.
Sept. 12-14—Southwest LP Gas Convention, Skirvin Hotel, Oklahoma City.
Sept. 13-17—Instrument Society of America, conference and exhibit, Convention Hall, Philadelphia, Pa.
Sept. 14-16—Pacific Coast Gas Assn, annual meeting, Hotel Casa del Rey, Santa Cruz, Calif.
Sept. 15-17—API, Lubrication Committee, Hotel Traymore, Atlantic City, N. J.
Sept. 15-17—AIChE, French Lick Springs Hotel, French Lick, Ind.
Sept. 16-18—NPA, Hotel Traymore, Atlantic City, N. J.
Sept. 17—Oklahoma Utilities Assn, Gas Div., Biltmore Hotel, Oklahoma City.
Sept. 27-28—IPAA, Plaza Hotel, San Antonio, Texas.
Oct. 4-6—AIME, Petroleum Division, fall meeting, Adolphus Hotel, Dallas, Texas.
Oct. 4-9—AGA, annual technical meeting, Ambassador Hotel, Atlantic City, N. J.
Oct. 4-9—American Association of Petroleum Geologists, midyear meeting, Pittsburgh, Pa.
Oct. 11-13—National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago, Ill.
Oct. 11-13—American Assn of Oilwell Drilling Contractors, annual meeting, Rice Hotel, Houston, Texas.
Oct. 12-16—National Chemical Exposition and National Industrial Chemical Conference, Coliseum, Chicago, Ill.
Oct. 14-15—AIME, Petroleum Division, Elks Club, Los Angeles, Calif.
Oct. 14-15—Texas Mid-Continent Oil & Gas Assn, annual meeting, Blackstone Hotel, Fort Worth.
Oct. 23-29—American Society of Metals, annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa.
Oct. 25-28—AIME, Metals Division, Hotel Adelphia, Philadelphia, Pa.
Oct. 25-29—American Welding Society, Bellevue-Stratford Hotel, Philadelphia, Pa.
Nov. 8-11—API, annual meeting, Stevens Hotel, Chicago, Ill.
Nov. 15-18—American Oil Chemists Society, fall meeting, Pennsylvania Hotel, New York.


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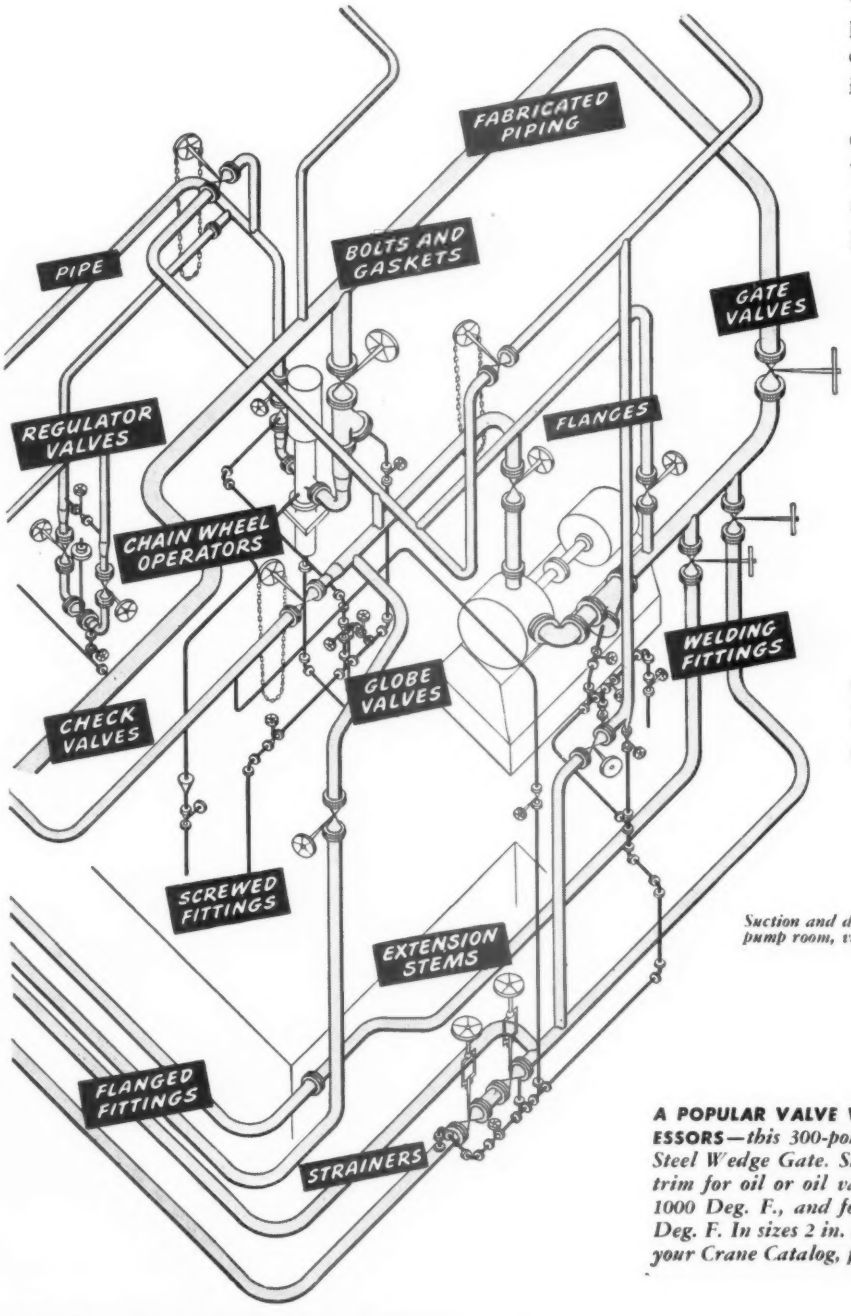


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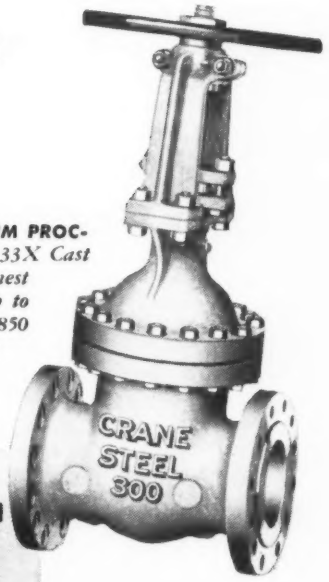


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## National Welfare and National Security

The petroleum industry has made a noteworthy and widely recognized contribution to the national welfare. So much so, indeed, that any threats to a continuation of this process arouse keen public apprehension. At the same time, both world wars were highly dependent upon oil. In World War I, the "Allies floated to victory on a sea of oil," and in World War II, the "United Nations flew to victory on the wings of petroleum." Today there is widespread interest in the bearing of oil upon our national security, and this subject is surrounded by a fear that oil will not be able to meet requirements fully in a third emergency. Hence there is a tendency to think of oil and national security as a thing apart from oil and national welfare. But as a matter of fact, the two are inextricably joined together.

The military and civilian demands for oil are so closely commingled that it is impossible to deal with the one without the other. For purposes of national security, it is not sufficient to contemplate the military use of oil alone. The effectuation of national defense involves also the use of oil in industry, transportation, and on the farm. It does no good to have oil for tanks and planes if there is inadequate oil to operate industry, to transport the worker to his job, and to provide the power for mechanized farming. Proposals, therefore, to base an oil policy upon the objectives of estimated military needs alone are likely, through their retarding effects upon normal industrial operations and expansion, to create conditions harmful both to national security and the economy in general, and therefore to defeat the very ends to which the recommendations are directed.

## Guiding Principles for a National Oil Policy

In view of the paramount need for the expansion of productive capacity to a level containing a margin of safety to meet all contingencies, the following guiding principles are inescapable. Any policy that does not recognize them all is faulty and will impede and not enhance progress.

1. Continuous and active search for oil is the most important element in maintaining and increasing the supply of oil. Success in this sector requires the *multiple efforts* that can only be the result of vigorous competitive activities conducted by many persons under the urge of strong incentives. Other procedures, often tried in other countries, have proved ineffectual.

2. The production of oil must be conducted according to modern engineering methods and these techniques continuously improved to gain optimum efficiency in resource development.

The conservation statutes of the oil-producing states, coordinated by the Interstate Oil Compact to Conserve Oil and Gas, have proved a helpful instrumentality to this end, assuring the minimum of decentralized regulation without impairment of competition. The technological progressiveness of the industry is a major creative force in this field and its pattern of operations should be preserved.

3. Our petroleum resources are not exact physical quantities but are materials subject to effective expansion in innumerable ways under the influence of a powerful multiplying and generative force; namely, technology.

Any policy based upon static inventories of the barrels in sight will prove erroneous by failing to evaluate technology, the multiplier. To a large degree technology determines the effective magnitude of the resource. It is important to maximize this creative force, which requires imagination as well as knowledge.

4. A financial system providing adequate capital formation for the replacement, improvement, and expansion of facilities and reserves is an integral part of the productive process. Without it, the industry would quickly exhaust its available resources and go into a decline. Unregulated prices and capital markets freely functioning are the best guarantees of sufficient capital formation.

5. Competition in all phases of the industry is the best assurance of efficiency and progress. This force is automatic in its effect and arises out of the diversity of activities that characterize the effort. Competition operates to keep prices functional and to maintain progress and growth. Price is the most efficient regulator and allocator and should be left free to perform its proper functions.

6. Central planning in the production of oil has yielded poor results wherever tried. Oil activities conducted by centralized governments illustrate the results of this method. There is a high degree of correlation between political climate and oil production. Government monopolies have invariably resulted in high prices and subnormal consumption.—*Excerpts from an address "Oil and National Policy" by Joseph E. Pogue, before the Rocky Mountain Oil and Gas Association.*

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# SCANNING WASHINGTON'S OIL HORIZON

By **MILBURN PETTY**

WASHINGTON—The increased dependence of the United States on foreign oil is due to the imbalance in our consumption and reserves, not to allocation of steel for development of foreign oil resources, according to Commerce Department officials, who point out that the U. S. is consuming more than two-thirds of the world's oil production with less than one-third of the reserves.

Such is the defense of these officials appearing at the summer hearings of congressional committees investigating charges of domestic producers that too large a part of our oil country tubular goods and line pipe is being exported.

"We cannot afford to ignore the fact," said Thomas C. Blaisdell, Commerce Department, "that the shipment of small amounts of steel to certain foreign petroleum projects makes more petroleum available on a worldwide basis—thus reducing the drain on American sources—than if that limited tonnage were retained for use in the U. S."

To this argument, Russell B. Brown, Independent Petroleum Association of America, replied that 1948 pipe exports will amount to 14 per cent of the total U. S. output as compared with only 4 per cent in 1935-39. And oil imports into this country have not increased by anything like that amount.

Shift in the government emphasis from the Middle East to Latin America was first indicated by the indefinite postponement of the Trans-Arabian pipe line. More recently, there have been other confirmations of this trend. For example, Francis McIntyre, Office of International Trade, which handles export licenses, told a congressional committee:

"The assignment of steel in large measure to the Latin American area and only in relatively minor measure to the Middle East—even though the Middle East oil is generally more available per ton of steel than Latin American oil—is a recognition of the fact that a source close to home is very important to us."

American operators in Latin America, however, are complaining that they cannot get enough steel to carry on their development programs. Creole Petroleum for example was given export licenses for only 25 per cent of its first quarter requirements, 50 per cent for the second quarter. An "oil crisis" in the United States this winter was predicted by Howard Page, New Jersey Standard, if Creole (SONJ subsidiary), does not get its full requirements for the last half of this year.

A government witness disclosed that Creole's program aims at 669,000 bbl a day by the end of 1948, reaching 946,000 bbl a day by the end of 1952. "Unquestionably," he added, "this program cannot be achieved without a substantial increase in the allocation of tubular goods from the U. S."

Apparently, Venezuela is pressing American operators to develop fully their present concessions, it was indicated recently by President Gallegos of Venezuela at a press conference here. He said no new concessions would be granted until this is done. He confirmed that Venezuela had considered organizing a government oil company to develop new areas—but not until existing concessions are developed to capacity which, he said, would be three times the present output of 1,300,000 bbl a day.

Despite troubled conditions in the Middle East, independent oil companies have been gaining a foothold there. American Independent Oil Company, composed of ten large independents, headed by Ralph K. Davies, has obtained a concession in the Kuwait Neutral Zone. Superior Oil Company of California expects to button up a concession soon with Saudi Arabia on the submerged lands along the coast of the Persian Gulf between the Kuwait Neutral Zone and Bahrein Island. (Superior is understood to have a British partner in this deal.) Three independent refiners—Globe, Ashland and Deep Rock—expect to get 10,000 bbl a day of Iranian crude when the pipe line from Agha Jari to the Persian Gulf is completed next spring, with Socony-Vacuum also to get 40,000 bbl a day from this same source for its refinery at Paulsboro, New Jersey.

But the military's interest in Middle East oil continues, despite the holdup in export licenses for the Arabian line. A five-year contract has just been completed with Cal-Texas Oil Products Company totaling nearly 100,000,000 bbl of products from refineries at Ras Tanura and Bahrein Island. Incidentally, the 100-octane plant at Bahrein Island (completed after the war ended) may be put on stream because of the military's need for aviation gasoline in Europe. (Those 400-plane flights daily into Berlin have made a big dent in supplies.)

The military is under instructions from the House Armed Services' petroleum subcommittee to submit a program for stockpiling of oil by January 1. The program—to cost hundreds of millions of dollars—may be largely a paper project, since there is neither crude nor products available to stockpile in the quantities contemplated by the congressional committee.

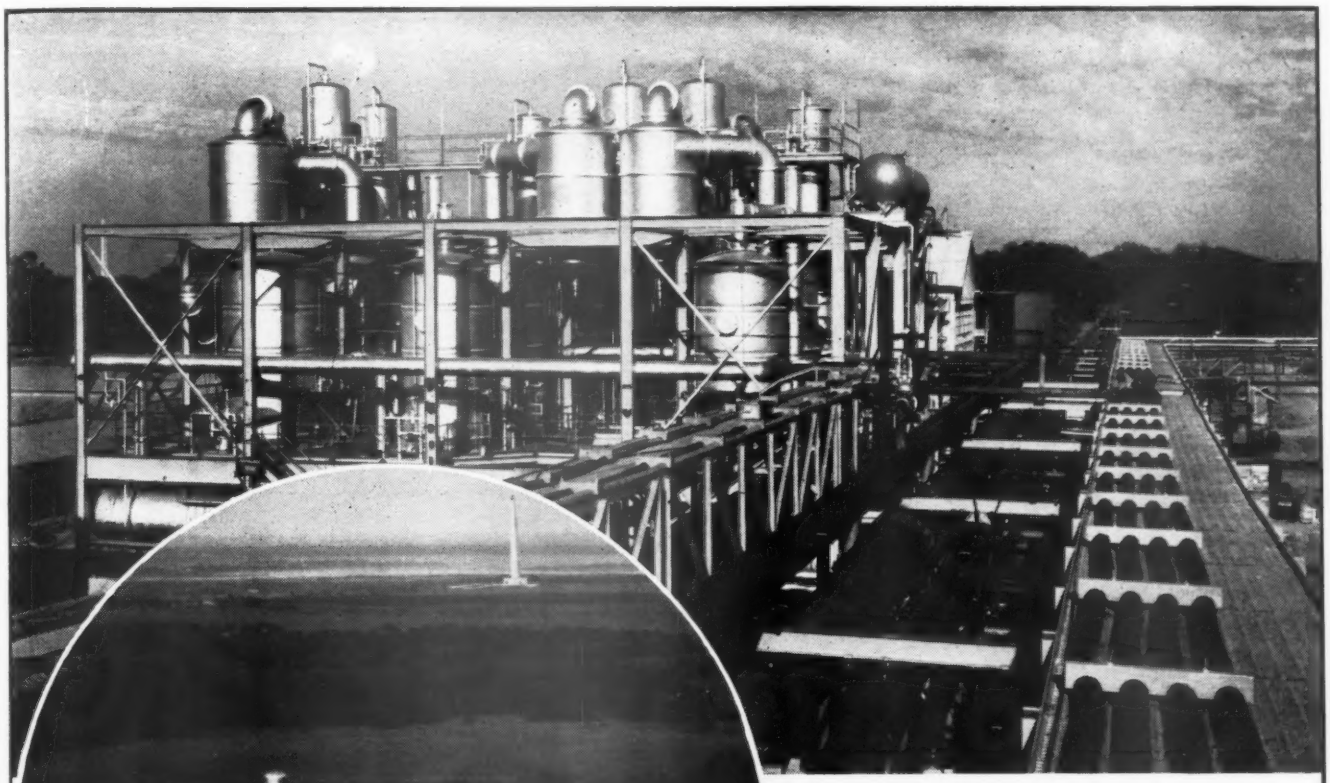
Commerce Department has been reluctant to grant export licenses for steel to Petroleos Mexicanos, the government-owned oil company. While admitting that it would be a good idea, from the U. S. standpoint, to have Mexican oil developed, a Commerce Department official recently testified: "We are not, however, convinced at all that they are getting the most efficient utilization of the materials that are going down here. Operations are very inefficiently run. The result, in terms of petroleum, both crude and refined, is that what they are getting per ton of steel is far below what they should get."

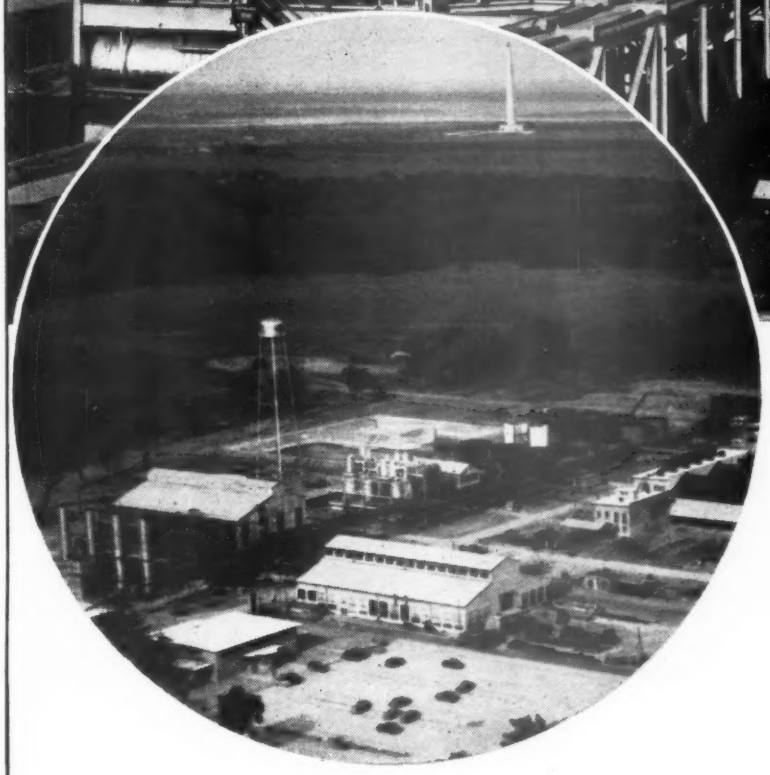
Commerce Department's attitude, like that of State Department, is expected to "soften up" with negotiations pending for American operators to act as drilling contractors for Pemex, financed by U. S. Capital. (These deals are in addition to those recently concluded by Cities Service and Texaco.)

On steel, the outlook is little changed. Tacked on the draft law passed in the closing hours of Congress was a "draft industry" amendment which provides for government allocation of steel to military contractors. President Truman has said that he does not intend to utilize this new legislation, unless the proposed voluntary allocation program under the Taft Law should fail to do the job. Even so, it is doubtful that the new law could be stretched to allocate steel to refineries making avgas for the military, or to producers supplying crude to such refineries. Commerce Department has decided that a voluntary program on oil country tubular goods would serve no useful purpose because, it was explained, the total output is in approximate balance with estimated requirements, and the entire production is going to the oil and gas industries anyway. Independent producers protested this explanation, saying that the Taft Law was intended to bring about equitable distribution as well as increase production.

There was another provision in that "draft industry" law which may be applied to the oil industry, should the occasion arise. It authorizes the military to place orders for needed materials—such as oil—and to compel delivery at negotiated prices under penalty of seizure and operation of the plants involved.

Interior's Oil and Gas Division has obtained a promise, in a letter to Secretary Krug from Treasury Secretary Snyder, that no changes in oil and gas tax regulations will be made without first consulting Interior, referring particularly to the present rule allowing the expensing of geological and geophysical items for income tax purposes. This pledge of cooperation by Treasury is now being used by Interior to head off any renewal of the threat to tax unit operation committees as "associations".





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# national petroleum situation

By H. J. STRUTH*,
Petroleum Economist

**AMPLE PRODUCTS SUPPLY.** Further improvement in the nation's petroleum products supply picture was shown in June. Stocks of refined products on June 30 were 12 per cent above last year and the combined change in stocks of all oils in the first half of the year amounted to an increase of 17,399,000 bbl, compared with a decrease last year of 10,433,000 bbl.

**GASOLINE DEMAND MET.** All fears of a gasoline shortage, fears that have not been shared by the industry, are dispelled by performance records. June demand reached a new high record of 2,722,000 bbl daily, against 2,521,000 bbl last year, but stocks of gasoline on June 30 were over 13,000,000 bbl greater than a year ago; 15 per cent larger. Refinery production in the first half of this year was 13 per cent above last year, while demand increased about 9 per cent. At the same time, production of natural gasoline was 13 per cent above last year.

**IMPROVED FUEL SUPPLY.** Efforts to effect better distribution of fuel oils, particularly distillates, are meeting with highly favorable results. Many dealers and some consumers have followed the industry's advice to stock up in advance of next winter's demand. Consumption in June, as indicated by statistics, is not all use, but includes advance buying by dealers as well as consumers. June demand was greater than last year by about 220,000 bbl daily. Production this year is 18 per cent above last year and the supply outlook presents little to support uninformed expressions of alarm over next winter's heating oil supplies.

**PEAK REFINING OPERATIONS.** Refinery runs to stills in June hit another all-time high by a daily average of 5,649,000 bbl. This is a net gain over a year ago of 529,000 bbl daily. Runs in the first half of this year are 14 per cent above the first half of 1947. Crude oil markets are still "tight" in view of continual expansion in refining operations. However, the supply of crude oil, including imports, is better than last year by about 11 per cent. Inability to build up stocks has resulted in a "hand to mouth" situation. Peak crude production of 5,546,000 bbl daily in June compares with peak refinery runs of 5,649,000 bbl daily.

*Editor, *The Petroleum Data Book.*

## Comparative Statistics, June, 1948

*All figures are computed on a Bureau of Mines' Basis**

| | June 1948℗ | May 1948℗ | June 1947 | This year to date | Last year to date | Per cent change |
|---|---|---|---|---|---|---|
| Wells drilling | 4,700 | 4,700 | 4,300 | 4,700 | 4,300 | + 9 |
| Total wells drilled | 3,268 | 3,384 | 2,694 | 17,607 | 14,841 | +19 |
| Development wells | 2,603 | 2,661 | 2,083 | 13,786 | 11,647 | +18 |
| Oil | 1,788 | 1,854 | 1,400 | 9,720 | 7,842 | +24 |
| Gas | 214 | 201 | 254 | 1,121 | 1,474 | —24 |
| Dry | 601 | 606 | 429 | 2,945 | 2,331 | +26 |
| Per cent dry | 23.1 | 22.8 | 20.6 | 21.4 | 20.0 | + 1.4 |
| Service wells | 164 | 189 | 184 | 1,034 | 913 | +13 |
| Wildcat wells | 501 | 534 | 427 | 2,787 | 2,281 | +22 |
| Oil | 78 | 90 | 60 | 408 | 350 | +17 |
| Gas | 24 | 18 | 20 | 126 | 86 | +47 |
| Dry | 399 | 426 | 347 | 2,253 | 1,845 | +22 |
| Per cent dry | 79.6 | 79.8 | 81.4 | 80.8 | 80.9 | — 0.1 |
| Crude supply* | 176,090 | 180,560 | 160,606 | 1,042,977 | 938,960 | +11 |
| Daily average | 5,870 | 5,825 | 5,354 | 5,731 | 5,188 | |
| Crude demand‡ | 175,590 | 182,060 | 161,492 | 1,040,125 | 926,429 | +12 |
| Daily average | 5,853 | 5,873 | 5,383 | 5,715 | 5,118 | |
| Crude stocks | 233,500 | 233,000 | 242,707 | 233,500 | 242,707 | — 4 |
| Days supply | 40 | 40 | 45 | 40 | 45 | |
| Natural gasoline production | 11,850 | 12,200 | 10,455 | 71,335 | 62,938 | +13 |
| Daily average | 395 | 394 | 349 | 392 | 348 | |
| Motor fuel production | 78,540 | 79,440 | 69,847 | 445,554 | 394,846 | +13 |
| Daily average | 2,618 | 2,563 | 2,328 | 2,448 | 2,181 | |
| Gasoline yield, per cent | 41.2 | 40.3 | 40.5 | 39.6 | 39.7 | — 0.1 |
| Motor fuel demand‡ | 81,660 | 83,625 | 75,629 | 433,753 | 397,850 | + 9 |
| Daily average | 2,722 | 2,698 | 2,521 | 2,383 | 2,198 | |
| Motor fuel stocks^ | 99,380 | 102,500 | 86,612 | 99,380 | 86,612 | +15 |
| Days supply | 37 | 38 | 34 | 37 | 34 | |
| Fuel oil production | 68,750 | 72,180 | 61,191 | 425,832 | 360,946 | +18 |
| Daily average | 2,292 | 2,328 | 2,040 | 2,340 | 1,994 | |
| Fuel oil demand‡ | 65,170 | 69,555 | 58,591 | 464,048 | 430,803 | + 8 |
| Daily average | 2,172 | 2,244 | 1,953 | 2,550 | 2,380 | |
| Fuel oil stocks | 98,020 | 87,340 | 83,191 | 98,020 | 83,191 | +18 |
| Days supply | 45 | 39 | 43 | 45 | 43 | |
| Refinery still runs | 169,470 | 175,100 | 153,604 | 999,585 | 880,132 | +14 |
| Daily average | 5,649 | 5,648 | 5,120 | 5,492 | 4,863 | |
| All refined stocks | 284,700 | 274,530 | 253,954 | 284,700 | 253,954 | +12 |
| Days supply | 48 | 46 | 46 | 48 | 46 | |

## Supply and Demand—All Oils

| | June 1948℗ | May 1948℗ | June 1947 | This year to date | Last year to date | Per cent change |
|---|---|---|---|---|---|---|
| Total supply, all oils | 193,070 | 197,990 | 174,822 | 1,147,587 | 1,035,487 | +11 |
| Daily average | 6,436 | 6,387 | 5,827 | 6,305 | 5,721 | |
| Total demand‡, all oils | 182,400 | 190,000 | 169,265 | 1,130,188 | 1,045,920 | + 8 |
| Daily average | 6,080 | 6,129 | 5,642 | 6,210 | 5,779 | |
| Change in stocks (total) | +10,670 | +7,990 | +5,557 | +17,399 | —10,433 | |

## Current Crude Oil Prices

| | | | |
|---|---|---|---|
| U. S. average | $2.61 | Louisiana | $2.62 |
| Texas | 2.61 | Arkansas | 2.43 |
| California | 2.42 | New Mexico | 2.40 |
| Oklahoma | 2.63 | Mississippi | 2.42 |
| Kansas | 2.62 | Illinois | 2.76 |
| | | Other states | 3.15 |

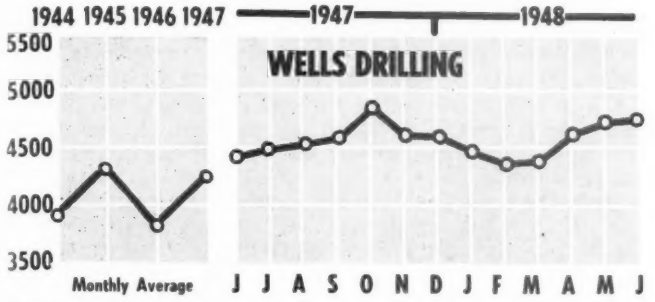
**Basic crude prices:**

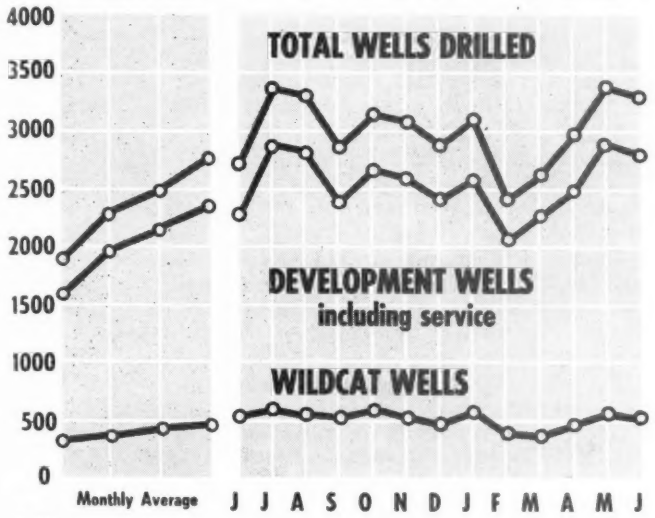
| | |
|---|---|
| Oklahoma-Kansas (36 gr.) | $2.57 |
| Texas Gulf Coast (36 gr.) | 2.86 |
| East Texas | 2.65 |
| West Texas (36 gr.) | 2.44 |
| California Signal Hill (26 gr.) | 2.41 |
| Pennsylvania, Bradford | 5.00 |

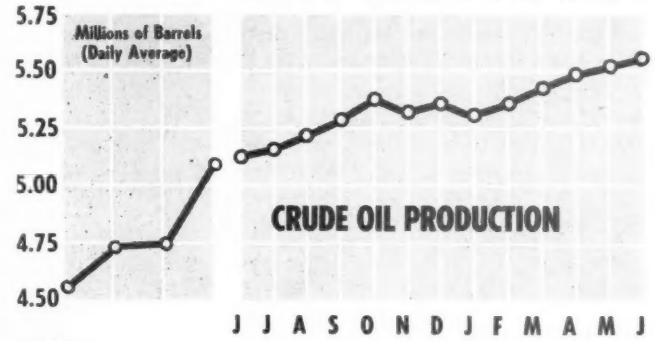
## Drilling and Production Statistics by States

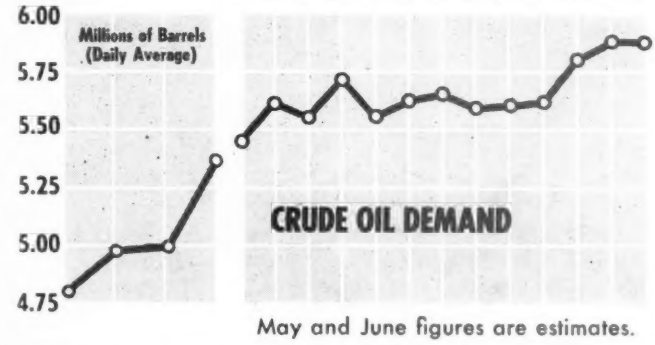
| | June 1948℗ | May 1948℗ | June 1947 | This year to date | Last year to date | Per cent change |
|---|---|---|---|---|---|---|
| Wells drilled (excl service) | 3,104 | 3,195 | 2,510 | 16,573 | 13,928 | +19 |
| Arkansas | 19 | 27 | 26 | 145 | 142 | + 2 |
| California | 247 | 264 | 175 | 1,403 | 968 | +45 |
| Illinois | 229 | 226 | 181 | 1,033 | 917 | +13 |
| Kansas | 298 | 308 | 181 | 1,425 | 1,136 | +25 |
| Louisiana | 204 | 220 | 111 | 1,025 | 623 | +65 |
| Mississippi | 32 | 39 | 59 | 189 | 230 | —18 |
| New Mexico | 48 | 50 | 49 | 303 | 268 | +13 |
| Oklahoma | 363 | 374 | 355 | 1,941 | 1,889 | + 3 |
| Texas | 985 | 1,030 | 725 | 5,448 | 4,253 | +28 |
| Other states | 679 | 657 | 648 | 3,661 | 3,502 | + 5 |
| Wildcats drilled (incl above) | 501 | 534 | 427 | 2,787 | 2,281 | +22 |
| Arkansas | 10 | 6 | 6 | 46 | 29 | +59 |
| California | 43 | 38 | 28 | 188 | 170 | +11 |
| Illinois | 26 | 31 | 51 | 166 | 189 | —12 |
| Kansas | 48 | 51 | 31 | 224 | 174 | +29 |
| Louisiana | 31 | 24 | 23 | 134 | 123 | + 9 |
| Mississippi | 4 | 8 | 13 | 42 | 45 | — 7 |
| New Mexico | 7 | 3 | 7 | 29 | 24 | +21 |
| Oklahoma | 71 | 83 | 70 | 403 | 386 | + 4 |
| Texas | 200 | 217 | 153 | 1,164 | 840 | +39 |
| Other states | 61 | 73 | 45 | 391 | 301 | +30 |
| Daily crude production | 5,546 | 5,510 | 5,099 | 5,430 | 4,916 | +10 |
| Arkansas | 87 | 88 | 81 | 86 | 80 | + 8 |
| California | 952 | 947 | 914 | 941 | 904 | + 4 |
| Illinois | 172 | 174 | 178 | 173 | 186 | — 7 |
| Kansas | 309 | 308 | 292 | 295 | 281 | + 5 |
| Louisiana | 488 | 485 | 432 | 481 | 425 | +13 |
| Mississippi | 121 | 123 | 94 | 120 | 88 | +36 |
| New Mexico | 131 | 129 | 108 | 129 | 106 | +22 |
| Oklahoma | 432 | 429 | 379 | 413 | 375 | +10 |
| Texas | 2,482 | 2,453 | 2,284 | 2,428 | 2,144 | +13 |
| Wyoming | 147 | 147 | 119 | 143 | 115 | +24 |
| Other states | 225 | 227 | 218 | 221 | 212 | + 4 |

*Unless otherwise stated all figures represent thousands of barrels. ℗—Preliminary. *Includes domestic production and imports.
‡Total demand, including exports. ^Includes finished and natural gasoline. ¶Revised.
Preliminary estimates based upon data supplied by American Petroleum Institute, U. S. Bureau of Mines, State Agencies, and other official sources.

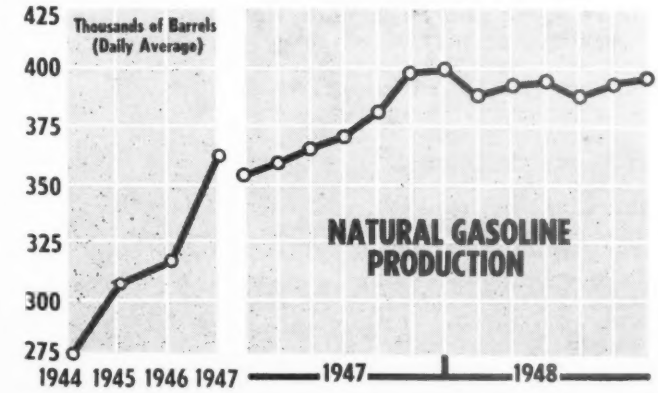


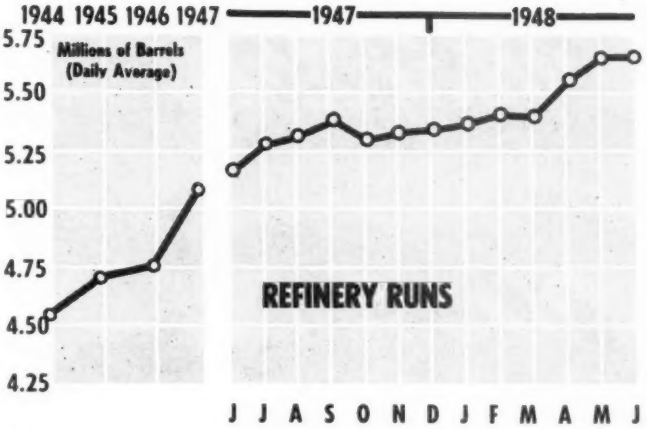



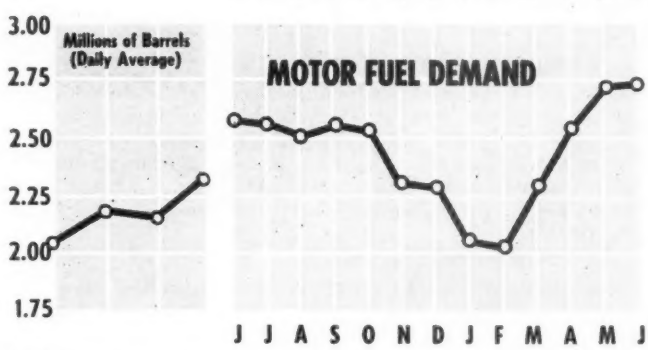



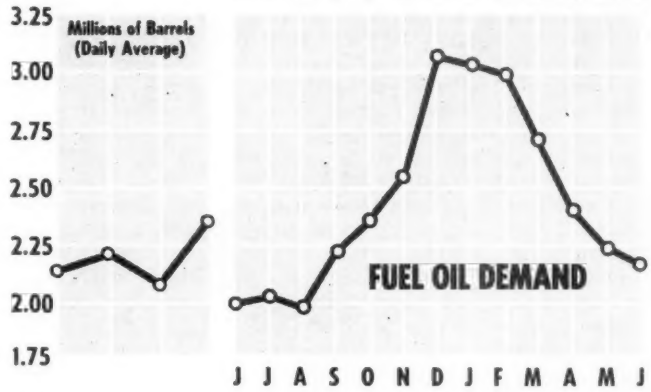



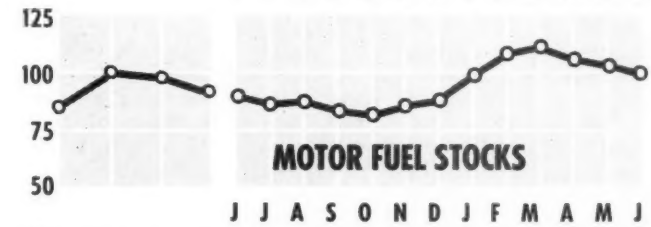

May and June figures are estimates.

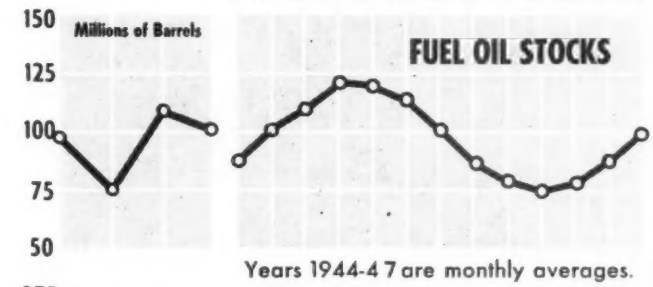


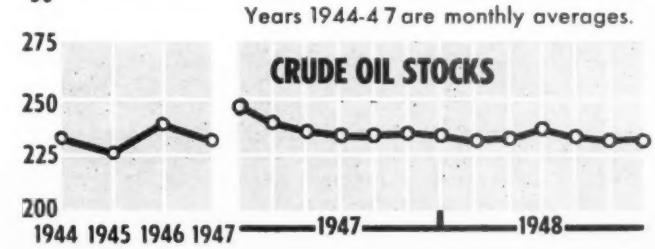



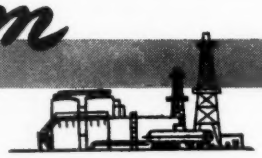




Years 1944-47 are monthly averages.



# highlights in oildom



● **CONSERVATION PROGRAM.** A 20-year conservation program, which it is estimated will increase the amount of oil that can be recovered from the North Cowden field in West Texas by 50 per cent, is now assured. G. H. Card, temporary chairman of the Grayburg producers group, announced that oil operators and royalty owners of about 80 per cent of the acreage in this Ector and Andrews counties oil field have voluntarily joined in the program.

Under the terms of the program:

1. Cities Service Oil Company is contributing its present natural gasoline plant in the field to the program and the group of operators will greatly expand it.

2. A cooperative gas-injection program will be started initially covering about 80 per cent of the 27,000-acre field (42 square miles). Casinghead gas produced from the Grayburg formation will be processed in the plant to recover natural gasoline and other liquid hydrocarbons. The residue gas will be compressed to high pressures and injected into the producing formation through about 75 wells. Gas not required for the injection program will be sold.

Card, who is division production superintendent for Stanolind Oil and Gas Company at Fort Worth, said that this is the first large gas-injection program in any West Texas limestone field, and that its successful operation should lead the way toward similar large conservation projects in other limestone fields, particularly in West Texas.

Engineers estimate that the gas-injection program, which will get into full operation about July, 1950, will increase the field producing life about eight years and increase the estimated future recovery of oil by about 50 per cent. "Even greater production may result," Card said, "since a gas-injection program through its performance almost always reveals other ways in which production efficiency can be substantially increased."

The North Cowden field, about 27 miles northwest of Midland and 17 miles north of Odessa, was discovered in 1930. It extends north and south about 12 miles and is about 5 miles across at the center of the field. Production is from the Grayburg limestone formation at approximately 4300 ft.

● **MIDDLE EAST CONCESSION.** An extensive petroleum concession to conduct oil exploration and development activities in the Kuwait-Saudi Arabia "Neutral Zone," located in the heart of the major oil region of the Middle East, has been concluded between the American Independent Oil Company of San Francisco and Sheikh Ahmad ibn Jabir as-Subah, ruler of the Arab state of Kuwait, it was announced in London, England, by Ralph K. Davies, president of American Independent and former Deputy Petroleum Administrator for War.

Under the terms of the concession, Davies said, American Independent is granted full oil rights to the Sheikh's undivided half interest in the Neutral Zone, on the Persian Gulf adjacent to Kuwait proper, an area that he holds jointly with King Ibn Saud of Saudi Arabia.

The area of the concession comprises a desert territory with a maximum length of 50 miles from east to west, and an average width of 45 miles. Although geologists in the past have explored the terrain and reported favorably on the presence of oil structures, no test wells have thus far been drilled in the Neutral Zone.

Geologists and other personnel of the company already are on the scene and are currently making arrangements to go ahead both speedily and aggressively, Davies declared.

Davies pointed out that in Kuwait (exclusive of the Neutral Zone) the Kuwait Oil Company, owned equally by the Anglo-Iranian Oil Company (British) and the Gulf Exploration Company (American), are operating what is probably the world's largest single oil field—a vast reserve estimated to contain some 9 billion bbl of petroleum. This field adjoins on the north the territory on which the new concession has been granted.

● **MANY ACCIDENTS PREVENTABLE.** Fifty per cent of accidents are preventable, and it is the responsibility of managers and employers in the oil well drilling industry to work toward their elimination, Howard P. Holmes, president of Two States Drilling Company, told safety engineers and directors at the Third Annual Drilling Industry Safety Clinic held in Dallas.

There were 2,050,000 disabling accidents in the nation in 1947, Holmes said, and 17,000 workers were killed on the job. The Dallas contractor said, "We in the drilling industry have a common goal—to keep men from getting hurt, and if they are injured, to do something for them."

Holmes, a former president of American Association of Oilwell Drilling Contractors, which sponsored the clinic, praised the association's efforts to keep the industry safety conscious through its various publications, posters, field schools, and rig safety meetings.

The clinic, opened by association secretary, J. Doyle Settle, discussed two new safety ideas that may go far toward reducing accidents. One is a white rig suit designed by W. F. Rickard, Shell Oil Company, Houston, and the other a standard color code for drilling rigs.

Though the use of a safety color code on drilling rigs is still in the experimental stage, it was the conclusion of speakers and the 110 safety men attending the clinic that a code may prove a valuable factor in reducing the high accident experience of the industry.

● **PRORATE HUGOTON FIELD.** Texas will join Oklahoma and Kansas in prorating gas production from the Hugoton field. Railroad commissioners at Austin have decided that wells in the northwest Texas Hugoton area produced from same reservoir as those in Oklahoma and Kansas and ordered proration to be undertaken based upon acreage and deliverability. Except for a difference in computing deliverability, Texas will prorate on about the same basis as Oklahoma and Kansas.

Nearly 175 wells are in the Texas Hugoton area, and Phillips Petroleum Company reportedly plans to drill 600 more to supply a Michigan-Wisconsin pipe line.

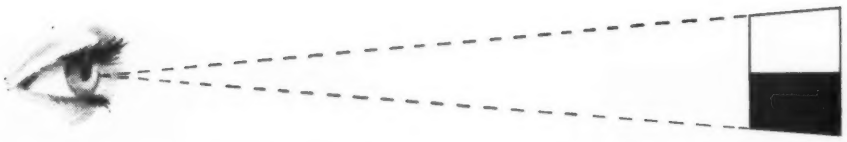
Proration likely will be adopted soon for the larger Texas Panhandle area, which has 2100 wells. An effort to allocate production to market demand was stopped in court several years ago. Railroad commission engineers found that Hugoton and Panhandle reservoirs are connected only slightly, tapering out across Moore County, Texas. For practical purposes, it said, the reservoirs should be considered separately.

● **INFORMATION PROGRAM.** Almost eight million pieces of editorial material have been distributed in the oil industry's information program since the beginning of this year, according to a report made to the National Oil Industry Information Committee.

Covering activities in all media, the report said that newspaper advertisements tying into the program, and stressing the progressive theme of the industry as well as the supply-demand situation, reached an estimated circulation of 37 million readers in the past month. Since January 1 of this year advertisements have appeared in publications having a circulation in excess of 395 million.

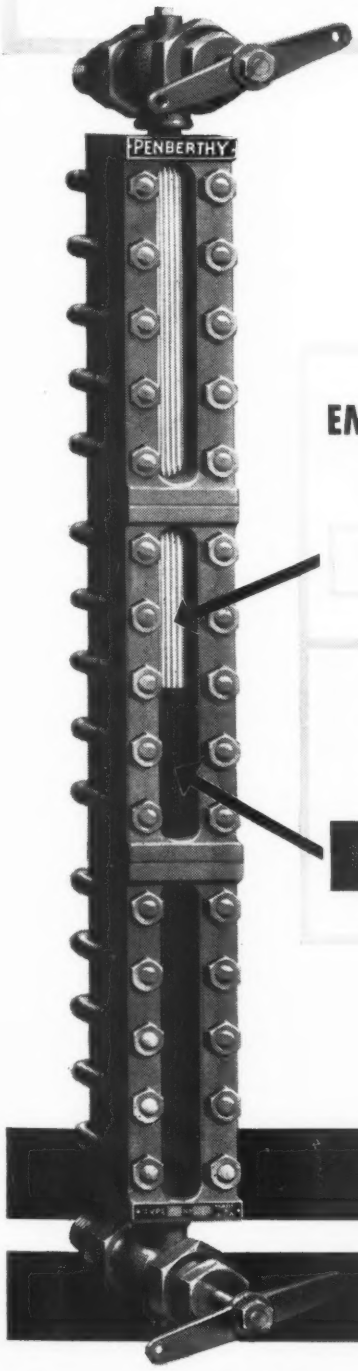
A highlight of the report to the OIIC said that district committees have developed a number of special activities to obtain broader and more active participation in the program. These have included special oil and public meetings at which oil industry and public officials spoke on the supply-demand situation and urged the wise and efficient use of petroleum products.

The oil trade press continued editorial and news support of program activities, while the agricultural press also printed comment traceable to the farm information campaign.



# YOU CAN READ

## the PENBERTHY Reflex GAGE as far as you can distinguish between BLACK and WHITE




There can be no mistake in reading the Penberthy Reflex Gage. Due to the optical effect of the prismatically grooved glass, the liquid always shows black, and the empty space white. This optical effect is unvarying and absolutely sure. As a result, you can read the gage correctly as far as you can distinguish black and white . . . read it at a glance. There is no squinting to see the meniscus . . . the dividing line between liquid and empty space is always sharp and unmistakable.

In addition to standard units, Penberthy Reflex Gages are also fabricated to customer's specifications from special alloys to meet unusual corrosive and temperature conditions. They conform with API-ASME requirements.

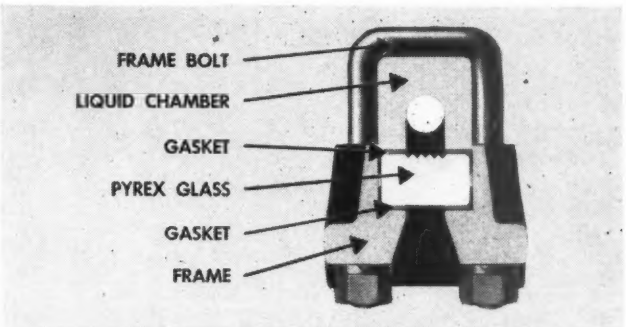
**PENBERTHY INJECTOR COMPANY**

*Established in 1886*

*Canadian Plant*
*Windsor, Ontario*

PENBERTHY PRODUCTS

**DETROIT 2, MICHIGAN**

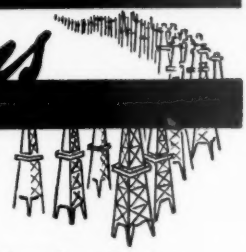



3398

**PENBERTHY Reflex**

**DROP FORGED STEEL • LIQUID LEVEL GAGES**

# current oil field operations



*Exploration wells that have found production.*

● **OKLAHOMA.** Mid-Continent 1 Hopping Estate, NE SW SW, 3-14n-15e, Muskogee. 10 BOPH Tyner, 2334-36 ft.

Mazda, D. H. Rowland, H. Blackstock 1 Wight, NE NW SW, 27-22n-10w, Major. 30 BOPH Manning, 6680-720 ft.

Continental 1 J. Maruska, C-183, SE SE SW, 16-10n-4w, Cleveland. 13 BOPH Chimney Hill.

Carter 1 Murphy-Sweeney, NE NW SW, 29-5-3w, McClain. 1-hr DST 3 B 58.8° cond & 2580 MCF gas daily.

Carter 1 Rose-Vose, C NW NE, 3-2n-3w, Garvin. 5 BOPH & 750 MCF gas daily, 8060-71 ft.

R. J. Caraway 1 School Land, NE NE SE, 34-18n-3e, Payne. 10 BOPH Wilcox, 4351-66 ft.

Falcon-Seaboard et al 1 Yancey, SE SE NW 26-14n-3e, Lincoln. 3000 MCF gas daily, Prue, 4110-12 ft.

Carter 1 Hall-Newey, C NE SW 9-4-3w, Garvin. 25 B oil in 11-hr, Gibson, 6033-48.

E. G. Whisnand 1 State-A, SW NW SE, 16-2s-11w, Cotton. 10,000 MCF gas daily from 1962-73 ft.

Deardorf 1 Howell, SW NE SE, 14-17n-3e, Payne. 50 BOPH Bartlesville, 3938-53 ft.

Continental 1 Hausler Bros., J. Pike sur, Wichita. 199 B oil in 15-hr Simpson, 5686 ft.

● **ARKANSAS.** McAlester Fuel 1 W. D. Black, 24-15s-21w, Columbia. 30-min DST 550 ft oil from 6533-39 ft.

Curtis Kinnard et al 1 Scales CNE SW 3-18s-17w Union. DST 440 ft oil Smackover 7759-69 ft.

● **INDIANA.** Carter 1 H. M. Montgomery, SE 18-3s-11w, Gilison. DST 1000 ft oil McCloskey 2470-86 ft.

● **MONTANA.** Sinclair Wyoming 2 H. G. Wilkins, SW NW NW, 28-9s-23e, Northwest Elk Basin, Carbon. 30 BOPD Lakota, 4564-76 ft.

Texas well at Big Wall, SE NE NW, 19-10n-27e, Musselshell. DST 600 ft oil Kibbey, 3098-133 ft.

● **KANSAS.** Palmer 1 Bredfeldt, SW NE SW, 7-18-9w, Rice. 448 BOPD Arbuckle, 3240 ft.

R. Gear et al 1 Trester SE NE SE 22-18-13w Barton. 35 BOPD Arbuckle 3307-48 ft.

J. M. Huber et al 1 Symns NE NE SE 28-22s-14w Stafford. 480 BOPD Kansas City 3704 ft.

Stearns Drlg. 5 Opdyche S½ SW 20-14s-13w Hall-Gurney field, Russell. 800 B oil in 6-hr from 2015-25 ft. New sand.

Sohio 1 Yeakley NW NW NW 17-18-13w Barton. Swb 4 BOPH Arbuckle.

Drillers Gas 1 Lorimor C SE NW 20-30-20c Kiowa. 307 BOPD Lansing-Kansas City 5156-278 ft.

Lewis Drlg., 1 Bradbridge SW SW SW 6-24-15w, Stafford & Edwards. 4350 MCF gas, Arbuckle.

Stanolind 1 Wheatley, C NE SW, 23-33-31w, Seward. 132 BOPD Marmaton, 5095-100 ft.

Harry Gore 1 Ruder, SW SW NE, 14-9-19w, Rooks. 3000 BOPD Arbuckle, 3462 ft.

Westgate-Greenland 1 McClennan, NW NW NE, 4-9-19w, Rooks: 314 BOPD Arbuckle, 3499 ft.

J. M. Huber 1 Cullins, NW SE, 20-28-17w, Kiowa. 35-min DST 100 ft oil and 2000 MCF gas daily, Mississippian, 4836-42 ft.

● **CALIFORNIA.** Richfield 1 Russell, 5-10n-27w, Cuyama Valley, Santa Barbara. 500 BOPD 38.3° from 2970-3360 ft.

● **ILLINOIS.** Wood River and NAPC 1 S. G. Seller, C W½ NE SW 16-1n-7e. 47 BOPD Aux Vases 3049-61 ft.

NAPC and Wood River 1 Vivian Aldridge SW NE NE 2-7-9e White. Oil from Pennsylvania 1540-606 ft; Cypress 2664-76 ft.

NAPC 1 Henry Garrison NW NE NE 24-6s-9e. White. 98 BOPD Aux Vases 2899-908 ft.

NAPC 1 Paul Franklin Heirs C N½ SW NW 22-3-7e Clay. 40 BOPD Cypress 2617-30 ft.

● **LOUISIANA.** V. P. Gage 1 Ambrose, SE SE 10-5n-6w, Natchitoches. 50-70 BOPD Wilcox, 5793-95 ft.

Newton 1 Nale, C NW NW 30-23n-1e, Union. 12-hr DST 97 B oil Nacatosh, 2206-10 ft.

H. J. Strief 2 Central Trading, 34-22n-15w, Caddo. 83 BOPD from 2340-60 ft.

Hunt & Gulf 1 Louisiana Delta Lumber, NW NW 6-4n-5e, Catahoula, 437 BOPD Wilcox, 5506-12.

● **NEW MEXICO.** A. H. Rowan Drlg. 5 Will Curry, 22-22s-37e, Lea. 213 BOPD 39°, Montoya, 7140-90 ft.

● **TEXAS.** Seaboard 1 Campbell, 29-32-3n, T&P sur, Howard. 48-min DST 31 B oil, 7846-64 ft.

NAPC 1 Davis, 3-10-T&P, Wilbarger. Swb 50 B oil in 12-hr from 4741-75 ft.

Humble 1-C Pickering, J. Rowe sur, Shelby. 35 BOPD 31°, Glen Rose, 5164-5212 ft.

Cities Service and Atlantic 1 Proctor, C SE NW, 335-G-CCSD &RGNG, Gaines. 410 BOPD San Andreas, 5144-98 ft.

Sun 1 Schattell, 7-mi sw of Snyder, Curry. DST 1770 ft 39° oil, Canyon, 6823-52 ft.

Lamar Hunt Trust, Estate 1 E. L. Kuhlman, Harris. 70 BOPD 36.4° from 5847 ft.

Standard of Texas 1 Hattie A. Reynolds, 22-3-H&TC, Crane. 880 BOPD Waddell, 5812-69 ft.

G. F. Getty 1 Mollie Day, ne 2-X-CCSD&RGNG sur, Crane. 72 BOPD 30.6°, Grayburg, 2705-820 ft.

F. Champman 1 Standard of Texas, Randolph, Reeves. 107 BOPD 42°, Delaware, 2900-06 ft.

Placid 1 Winfree, C. West sur, Orange. 5 BOPH 40° from 7710-15 ft.

T. D. Humphrey 1 Tuggle, Fitzgerald sur, Kaufman. 47.6° oil from Bacon lime.

J. F. Morse 1 Walter Talbot, blk 2, J. McNabb sur, Jefferson. 200 BOPD 38.6° from 7759-61 ft.

Fullerton and Ryan 1 Carrie McDonald, Calhoun. 137 B 55.4° & 1000 MCF gas daily, 9634-52 ft.

Seaboard 1 F. O. Maston, Cochran. 180 BOPD San Andres, 4923-5001 ft.

Honolulu 1-13-A, Ellwood, Hockley. 236 BOPD 24.3°, Glorieta., 5875-6014 ft.

Sohio 1 Lane City Townsite Unit, Wharton. 207 BOPD 25.9° Frio, 5464-78 ft.

Phillips 1 Humphreys, 28-147-Grimes CSL, Taylor. 33 BOPH Frazier, 2684-700 ft.

Standard of Texas 1 Lucinda Green, Milam. 19-min DST gas & 30 ft oil, Edwards, 5675-712 ft.

Lone Star A-1 Kleiner, 2-mi n. of Cisco, Eastland. 96 B oil in 12-hr, Mississippi, 4000-14 ft.

Anderson-Prichard 1 Windham, SW SE sec 369, Callahan. 343 B oil 18-hr, Ellenburger, 4348 ft.

L. T. Burns 1 G&C Prideaux, 1835-TE&L, Archer. 125 BOPD from 3168-75 ft.

American Republics 1 Newton County Lumber, Newton. 150 B 54.3° cond & 10,000 MCF gas daily from 7322-24 ft.

A. Guiberson 1 Lassiter, sec 308, blk 1-A, H&TC sur, Coke. 9.6 BOPH from 6495 ft.

● **UTAH.** Carter 1 Ruth Nelson, 5-mi sw Vernal, Uintah. DST 5000 MCF gas, Wasatch, 7060-77 ft; 3700 MCF gas 7077-89 ft.

● **WYOMING.** Barnsdall & Sohio 1-C Dorothy Fox, SE SW, 6-57n-97w, Big Horn. DST 630 ft 16.8° oil, 3413-30 ft; 2400 ft oil, 3428-45 ft.

Superior & California 1 Parkinson, SE NE 5-16n-75w. Swb 326 BOPD 22°, Tensleep, 3741 ft.

Ohio & California A-6 William Kyle, NE SE NE, 26-21n-79w, Medicine Bow, Carbon. 281 BOPD, Tensleep, 6860 ft.

Continental 1 Sussex Unit 10-mi. n. Salt Creek field, Johnson. DST 2000 BOPD 36.5°, Dakota-Lakota, 7693-726 ft.

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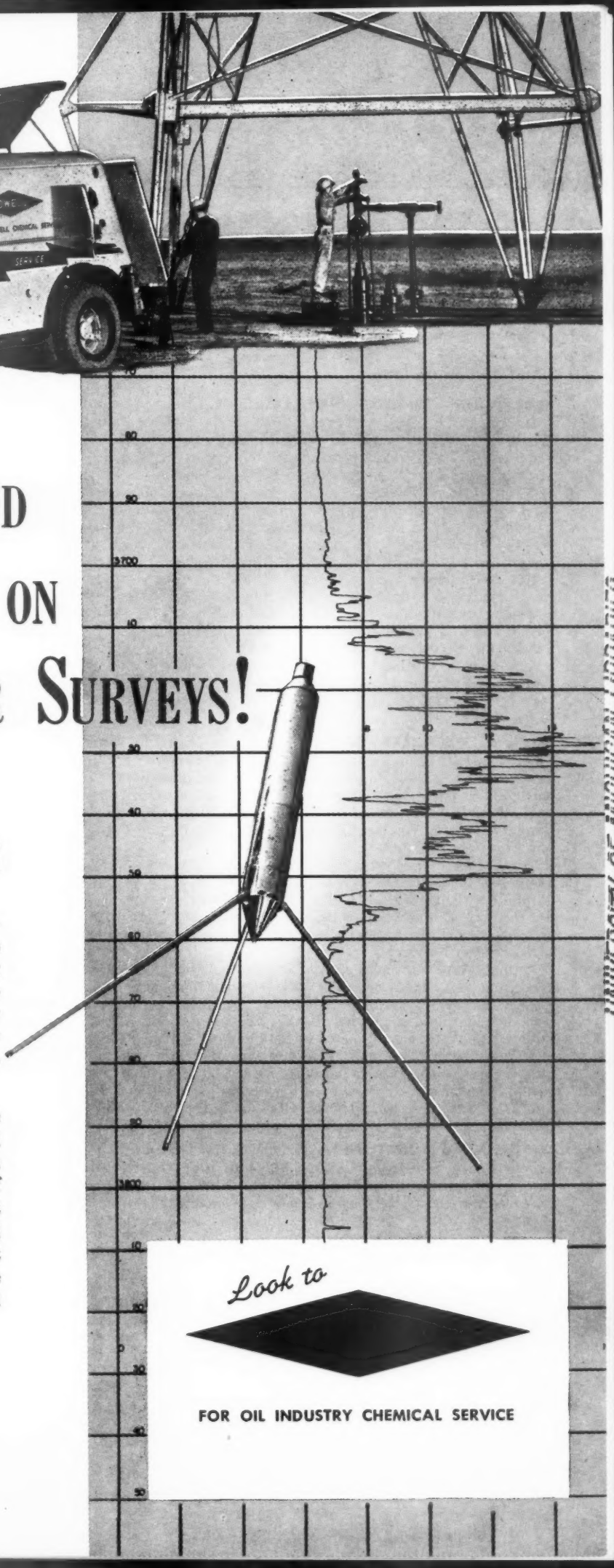

*Look to*



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# pipeline developments

● **ADDITIONS TO TEXAS-CALIFORNIA LINE.** El Paso Natural Gas Company of El Paso, Texas, has asked the Federal Power Commission for authority to build natural gas transmission facilities that will increase the daily delivery capacity of the company's system to 180,000,000 cu ft.

The additional facilities consist primarily of about 450 miles of 30-in. pipe line running parallel to portions of the company's existing 26-in. line between Lea County, New Mexico, and a point on the Colorado River near Blythe, California. In addition, the company is proposing to construct about 33,000 hp of new main line compressor capacity and a number of related facilities, including feeder and gathering lines.

Total anticipated cost of the proposed facilities, with a provision for contingencies, was estimated by the company at $56,000,000. In its application, the company stated that the gas it proposed to transport would be obtained from supplies of flare gas in the Permian Basin of West Texas and Southeast New Mexico. This gas, the company added, is now being vented to the air for lack of a market.

● **PLANS WEST TEXAS-ARIZONA LINE.** San Juan Pipe Line Company of El Paso, Texas, plans to build a 451-mile natural gas pipe line of 26-in. diameter from the San Juan Basin of northwestern New Mexico to a point in Mojave County, Arizona, about 20 miles east of Needles, California. Purpose of the project is to supply natural gas for ultimate distribution in the San Francisco Bay Area of northern California.

The proposed line, estimated to have a delivery capacity of about 150,000,000 cu ft a day, would be connected at its western terminus with facilities of El Paso Natural Gas Company. Under the proposal, El Paso would receive the gas from San Juan and deliver it to companies which are now selling gas to consumers in the Bay area.

In addition to transmission pipe line, the San Juan Company also proposes to build over 100 miles of feeder and gathering lines, a compressor station with 3000 hp, a natural gasoline extraction plant, and a gas dehydration plant. Total cost of the proposed facilities was estimated by the company at $28,000,000.

The company stated in its FPC application that the distributing companies supplying natural gas to the Bay Area are currently meeting their requirements with gas produced in California but that they will experience a shortage of about 150,000,000 cu ft a day by 1951 unless the project goes forward.

● **TO LOOP CALUMET LINE.** Chicago District Pipeline Company will loop its existing Calumet line with approximately 41 miles of 24-in. pipe extending from Joliet to the southern city limits of Chicago. The proposed new line, estimated to cost about $4,000,000, is intended to provide certainty of service to the company's existing customers and to permit storage of gas that can be used in meeting the peak requirement of the present market.

● **OHIO FACILITIES INCREASED.** Ohio Fuel Gas Company, Columbus, will construct and operate additional natural gas pipe line facilities in Ohio to increase transmission capacity to Toledo, Fremont, and adjoining areas. Cost of the project is estimated at $3,082,000.

The facilities include approximately 61 miles of 20-in. pipe line between Pavonia compressor station in Richland County, Ohio, and Toledo. The company stated that the proposed 20-in. line will replace existing pipe lines of smaller diameter so as to provide a continuous 20-in. pipe line between the two points.

● **TRANS-ARABIAN RELEASES PIPE.** Steel pipe originally intended for use in construction of the Trans-Arabian pipe line has been released to the Tennessee Gas Transmission Company of Houston, Texas, and will be used to increase the supply of fuel for the eastern United States, it was announced by Burt E. Hull, president of Trans-Arabian Pipe Line Company. The pipe, 30 and 31 in. in diameter, will go into the Tennessee gas system, which runs from the Mexican border in Texas to West Virginia.

The Trans-Arabian Pipe Line Company decided to release the pipe because of the Department of Commerce's action in delaying export licenses for shipment to the Middle East. Hull said his company intended to complete the line between the producing fields of Saudi Arabia and the Mediterranean as soon as conditions permitted, but that in the meantime it wished to contribute toward improvement of the domestic fuel supply situation.

Some 80 miles of the steel pipe are involved in the first shipments. A total of 255 miles of pipe—64,000 tons—is expected to be shipped after manufacture at the Consolidated Western Steel Corporation plant at Maywood, California.

In Houston, Gardiner Symonds, president of Tennessee Gas, said that the pipe was obtained on a trade-out basis and that Tennessee Gas will repay Trans-Arabian with pipe from its deliveries scheduled later in the year.

● **NEW MAJOR CARRIER PROPOSED.** Texas Gas Transmission Corporation has applied to the Federal Power Commission for authorization to construct and operate an 840-mile natural gas pipe line from the Carthage field of East Texas to a point near Middletown in Southwest Ohio.

Altogether the project would consist of 114 miles of 20-in. pipe line from the Carthage to the Lisbon field, 726 miles of 26-in. pipe line from the Lisbon Field to the eastern terminus, 10 compressor stations with 68,800 hp, and other necessary facilities. Total cost of the project, including contingencies, is estimated at $73,500,000. The corporation expects to start making deliveries at the eastern terminus of the line in the latter part of 1949 and to complete the entire project by the fall of 1950.

● **PLANS ADDED FACILITIES.** Northern Natural Gas Company of Omaha, Nebraska, proposes to construct new facilities that would add to the daily delivery capacity of its natural gas transmission system by 40,000,000 cu ft.

The proposed facilities include compressor units with an aggregate of 8900 hp at five existing compressor stations, 28.54 miles of 24-in. pipe line, and 17.15 miles of 20-in. pipe line. They would be built along the company's existing pipe line system which extends from the gas fields of Kansas, Oklahoma, and Texas to the Twin-City area of Minneapolis and St. Paul. The company proposes to start construction in the spring of 1949 and complete it in November, 1949. Cost of the addition has been estimated at $4,008,000.

● **MAGNOLIA LINE OPENED.** Magnolia Pipe Line Company, an affiliate of Socony-Vacuum, has completed its first delivery of crude oil through its new 650-mile long, 20-in. pipe line. J. L. Latimer, president, announced. The line is the longest built since the war.

The crude oil reached Patoka, Illinois, 365 days after the first joint of pipe was laid on the carrier from Corsicana, Texas. The line can pump a volume of 100,000 bbl of oil a day, the equivalent capacity of about 440 railroad tank cars. An average pressure of approximately 700 psi is maintained.

The line connects Magnolia's pipe line system in Texas and Oklahoma with its network in Illinois, Indiana and Ohio. It further connects with Socony-Vacuum Oil Company, Inc., pipelines at Patoka, and oil is delivered to that company's refineries at East St. Louis, East Chicago, Trenton, Michigan, and Buffalo, New York.

● **PREDICTS VAST EXPANSION.** About 29,000 miles will be added to the world's oil and natural gas pipe line distribution systems by the end of 1951. Dr. M. A. Hyde, Westinghouse Electric Corporation engineer, stated in Mexico City at a meeting of the American Institute of Electrical Engineers. Under construction now in the U. S. are 10,900 miles of pipe lines for the transportation of natural gas, 7600 miles for crude oil, and 5300 miles for crude oil products; outside the U. S. 5200 miles are being built for all purposes, he stated.

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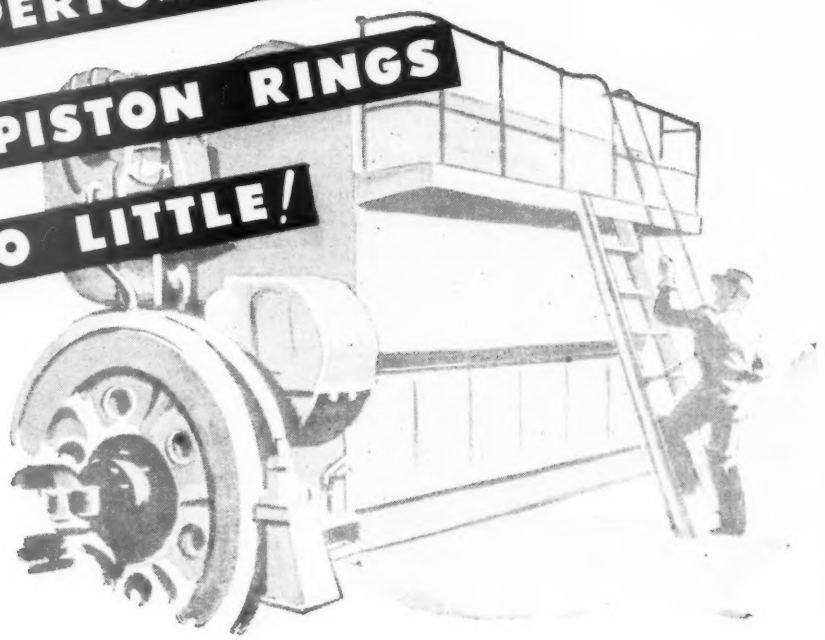

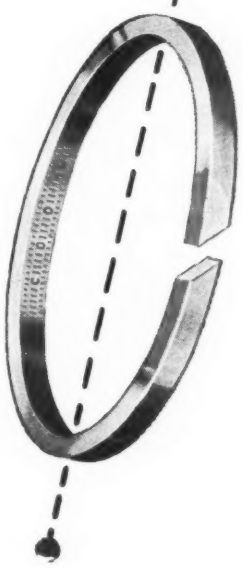

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# refining and natural gasoline activities

● **GASOLINE PLANT FOR COKE COUNTY.** Sun Oil Company is to construct a casinghead gasoline plant in the Jameson oil field of northwest Coke County, Texas, with construction scheduled to start by August 1. It will have a capacity of ten million cu ft of gas a day and will produce 30,000 gal of natural gasoline and other liquid hydrocarbons daily. It is expected the plant will be ready for operation by March 1, 1949. Contract has been let to J. F. Pritchard and Company.

There are 27 producing oil and gas wells in the Jameson field, all owned by Sun, and more drilling. The field has a daily allowable of 2677 bbl.

The plant in Coke County is one of nine in various oil producing areas throughout the country provided in a $12,000,000 program by Sun Oil Company's natural gasoline division, of which James E. Pew of Philadelphia is manager.

● **BRITISH-AMERICAN PLANS.** A refinery program to enable the British-American Oil Company to supply its customers entirely from its own production is well under way, W. K. Whiteford, president, has reported. The largest single unit in the company's refining capacity is being rushed to completion at Montreal East.

In addition to this major capacity increase, a fluid catalytic cracking unit, a gas recovery unit and a catalytic polymerizing unit, which will provide motor fuels of high quality, are being installed. The Montreal program alone will cost $15,000,000.

● **WYOMING UNIT PLANNED.** The Pure Oil Company and Texas Gulf Sulphur Company have completed an arrangement for installation of a sulphur recovery plant in Pure Oil's new field at Worland, Wyoming, it was disclosed by Comer Plummer, Pure Oil vice president.

The plant, scheduled for completion and operation next year, will be capable of processing a minimum of 30,000,000 cu ft of gas a day containing 10,000,000 cu ft of hydrogen sulphide.

The contract calls for processing the raw gas in a manner that will remove the hydrogen sulphide and convert it into sulphur. The remaining processed sweet gas and liquid hydrocarbons will be returned to Pure Oil.

● **REFINERY NEAR LONDON.** The Anglo-Iranian Oil Company is planning a 20,000-bbl-a-day refinery on the Thames estuary, near London, Business Week reports. Gulf Oil Corporation, which works with Anglo-Iranian in Kuwait and other Middle East fields is said to be in on the program. The British government has approved proposals that the plant be built at a cost of $120,000,000, allowing officials of the two firms to worry over the source of the steel to be required.

Expansion of Anglo-Iranian's two existing refineries in Great Britain is already under way. Output at Llandacry, in Wales, should reach a rate of 6,000,000 bbl by the end of 1948 and over 20,000,000 by the end of 1949. The Grangemouth refinery is supposed to hit a 10,000,000 barrel-a-year rate by 1950.

● **NEW AVIATION OIL.** The Gulf Oil Corporation recently announced development after six years research of a new heavy duty oil designed especially for light aircraft engines. The oil, recommended only for horizontal engines in light aircraft, is designed to decrease operating and maintenance costs and to give greater engine reliability.

● **CONTINENTAL BUYS TOLUENE PLANT.** Purchase by Continental Oil Company of the toluene plant erected at Ponca City, Oklahoma, during the war by Defense Plant Corporation, and used in the manufacture of nitration grade toluene and aviation gasoline, was announced by H. G. Osborn, Continental vice president in charge of manufacturing. The purchase price was said to be approximately $175,000. Original cost to the government was $1,276,103.

Completed in September, 1943, the plant was first used to manufacture nitration grade toluene used in production of war bombs, and later was converted to produce toluene as a blending agent for the first 100 octane aviation gasoline manufactured in Oklahoma. The plant was closed in July, 1945, and remained inactive until the latter part of 1946, when it was leased by Continental Oil Company to be used periodically for the manufacture of gasoline and other products.

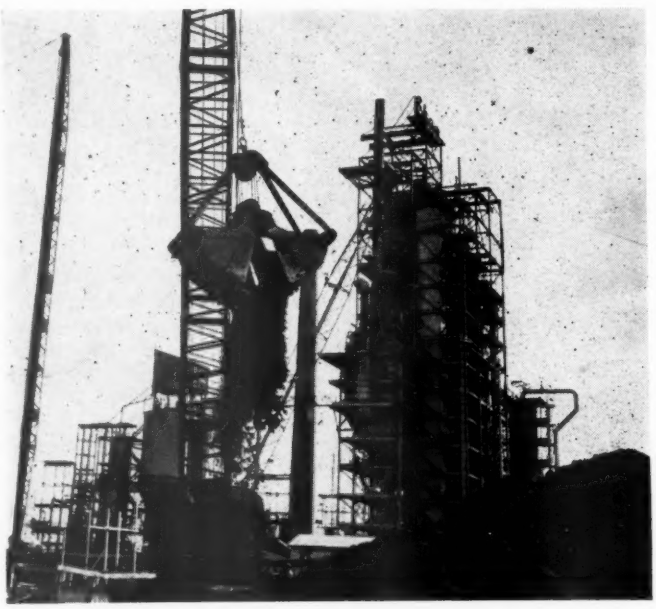
● **ELECTRA GASOLINE UNIT.** The Texas Company will modernize its Electra gasoline plant shortly, according to C. B. Williams, West Texas division manager.

Although the plant is 32 years old, gas is still available in sufficient quantities to warrant the installation of absorption and distillation facilities in order to strip the gas more efficiently and for the recovery of additional butane and propane. The Texas Company is the largest oil and casinghead producer in this area.

The Electra plant commenced operations in February, 1916, as a compresstion type natural gasoline plant. In 1922 its lines were extended and the plant enlarged to handle additional gas from the newly discovered South Electra pool.

● **SINCLAIR PLANT SALVAGED.** Sinclair Oil Corporation has ceased operations at the firm's Fort Worth, Texas, refinery and the installation will be salvaged. The Fort Worth plant was closed because a pipe line direct from Houston to Kansas City made the Fort Worth unit unnecessary. The line has a capacity of 25,000 bbl daily.

● **BREAK GROUND FOR NEW CRACKER.** A "clamshell" bucket scoops up earth as work begins on the foundation for a new fluid catalytic cracking unit at the Bayway refinery of Esso Standard Oil Company at Linden, New Jersey. The new unit



will be one of the largest ever built and is part of an expansion program the company, an affiliate of Standard Oil Company (New Jersey), has undertaken to increase the capacity of its refineries along the East Coast and at Baton Rouge, Louisiana.

Jersey's total world-wide expenditures for expansion programs reaches one billion dollars for 1947 and 1948. The complicated structure of the new catalytic cracking unit will tower 12 stories. It is scheduled for completion in 1950.

In the background of the photograph is the present catalytic cracking unit that was put into service in 1942.

P 111.61

**Two drilling wells, Russell B 11-8 and Russell A 18-5 are in the background. Beside the latter are two 1000-bbl receiving tanks. On the roadway, between the folded mast and the field truck, is discovery well, Russell A 28-5. To the left may be seen tank trucks hauling oil to Richfield's Lake Station at Maricopa, pending the construction of a pipe line.**

# Oil discovery Cuyama Valley, California

By RICHARD SNEDDON, *Pacific Coast Editor*

RICHFIELD OIL CORPORATION has found a new light oil field in the Cuyama Valley in Santa Barbara County, California, that has all the appearance of a major strike. Two wildcat wells were completed within a week, for 500 bbl and 4000 bbl, respectively, of high grade refining crude.

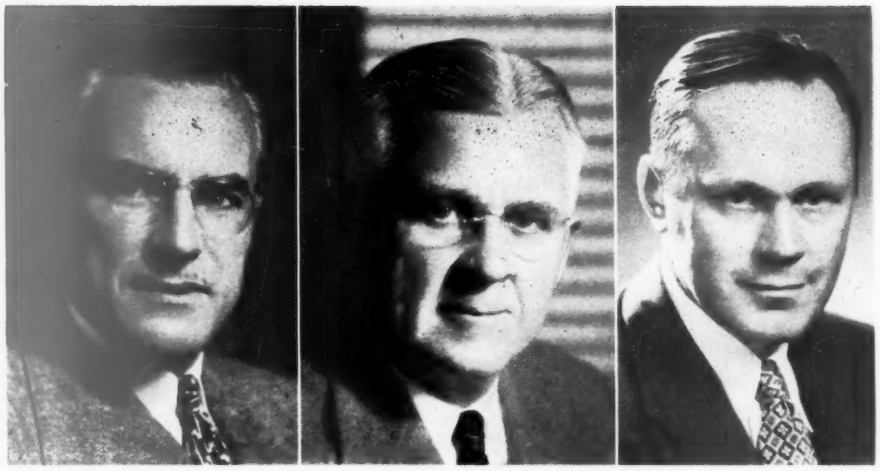
**EXCLUSIVE**

The first intimation of a discovery came in a somewhat placid announcement by Richfield on June 8, 1948, that its Cuyama Valley wildcat, Russell No. 1 (now A 28-5), had tapped a substantial body of oil sand at approximately 3000 ft. A second notice, issued about a week later, was not quite so casual. In fact, it held a faint but distinct note of excitement. The Russell well, according to this one, had been placed on production, and was flowing 500 bbl of 38.3-deg API oil, through a 48/64-in. choke, from a sand interval between 2970 and 3360 ft. All of which, it went on to say "marked the discovery of a new light oil producing region in California."

☆ ☆ ☆

**As this issue was going to press Richfield brought in its third producer in the new field, Anderson Colgrove 26-30, which flowed an estimated 6000 bbl a day from 2970 ft. This is the largest producer yet discovered in the area.**

That took the speculation out of the project and substituted some real, tangible data, whereupon the news traveled widely and quickly. Hardly had the first wave of reaction rippled through the industry, however, when, on June 17, 1948, Richfield's second well, Anderson-Colgrove 37-30, located about 2¼ miles to



F. A. MORGAN R. D. MONTGOMERY ROLLIN ECKIS

**Men behind Richfield's Cuyama Valley discovery.**

**Frank A. Morgan,** a former consulting geologist and petroleum engineer, joined Rio Grande Oil Company in 1929. At the time the merger took place between Rio and Richfield, he was manager of production and operations for Rio Grande. He is now vice president of Richfield Oil and manager of exploration.

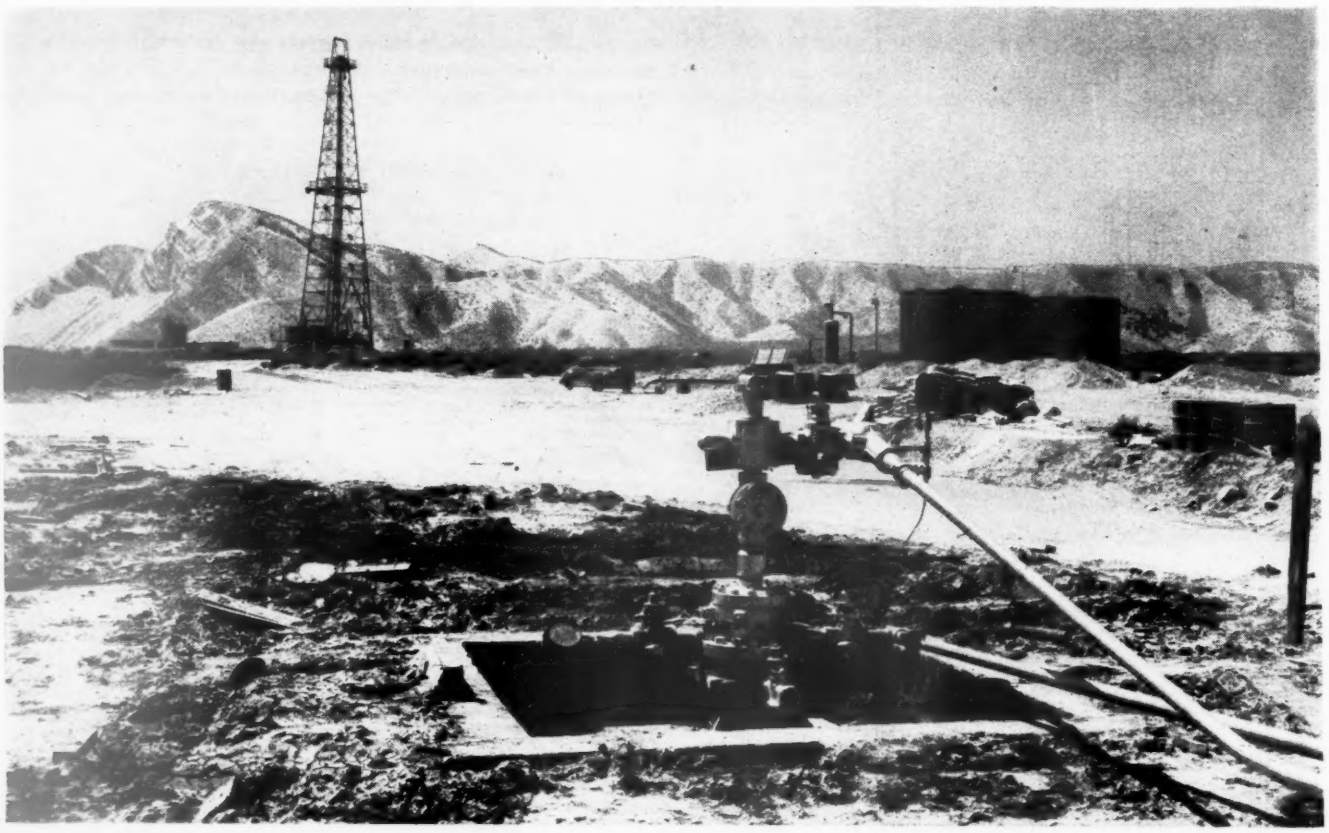
**Richard D. Montgomery** came to the Richfield Oil Company in 1926 from Standard of California for whom he had charge of developments in South America. He was manager of production for the old Richfield, but when the reorganization took place, he was appointed manager of exploitation, a postion he still holds.

**Rollin Eckis** originally came to Richfield from the geological department of The Texas Company. From the date of Richfield's reorganization in 1937 until 1946, he was assistant chief geologist, with headquarters in Bakersfield. Upon the resignation of Harold Hoots in 1946, he was appointed chief geologist.

the northwest, came in flowing an estimated 4000 bbl of 33-deg API oil from a depth of 3019 ft. Although, as we have indicated, the Richfield people are not inclined to wax violently enthusiastic about their field operations, they were obviously by this time slightly more than pleased with developments in the Cuyama Valley. The industry, too, had shed all semblance of nonchalance, and was now sitting bolt upright, taking more than a casual appraisal of the situation.

There was, of course, an immediate scramble for properties in the area of the discovery, but available leases were few and far between. Richfield had quietly geologized the Cuyama over the last four years, and by the time it appeared to be worth a play, had acquired about 150,000 well-located acres. The first test well, incidentally, was spudded on the H. S. Russell, Cuyama Ranch, on Section 5-10n-27w, and temporary headquarters have been established in the Russell ranch house. The second well was located on Section 30-11n-27w, just in front of that familiar landmark known as Whiterock Bluff. That is, the Anderson-Colgrove 37-30. It might be said that almost before the discovery had been realized by the public, Richfield had several additional wells under way, and the ordinarily quiet region comprised of the Cuyama Ranch and its environs was beginning to show signs of bustling activity. Tank trucks were shuttling back and forth between the field and Maricopa, carrying the oil to Lake Station just east of Buena Vista Lake. Riggers

**In foreground, Anderson-Colgrove 37-30 that flowed 4000 bbl of light oil a day. Close by is a drilling well, Anderson-Colgrove 26-30 (which later came in with 6000 bbl a day). To the right is tank farm site, and in background is famed Whiterock Bluff.**



moved in and began setting up receiving tanks. Construction crews started clearing off new drilling locations and tank farm sites, and it became increasingly evident that the quiet days of that part of the Cuyama Valley were over.

According to a Richfield report, the Cuyama Valley, heretofore unexplored, is a large sedimentary basin, approximately 50 miles long and 15 miles wide, situated midway between the San Joaquin Valley and the Coastal region, each of which is a major oil producing region of California. It is probably true that no actual subsurface exploration such as that conducted by Richfield had ever before been attempted; however, in February 1941, the *AAPG Bulletin* published an extensive and extremely interesting article by Eaton, Grant, and Allen, entitled, "Miocene of Caliente Range And Environs, California." These authors made it clear that their investigations were far from complete. Over a considerable number of years, they had each spent a few days of field work at intervals in the district discussed, mostly as occasional weekends. They, therefore, published their findings, not as conclusions, but rather "for the purpose of calling attention to the district and providing a preliminary framework for future investigation." The district discussed included the Cuyama Valley, the Caliente Range, and part of the Carrizo Plain.

We find it difficult to dismiss this fine bit of work without paying tribute to the authors. It is indicative of the altruism that pervades the geological profession that these men, wholly for the benefit of others, took the time and the trouble to prepare this helpful and thoroughly interesting compilation. The paper is a highly commendable piece of work that gives an excellent account of a very unusual geological area. Apparently because of an extremely rare combination of factors, the region presents a "maximum stratigraphic, structural, and faunal record for the Miocene; that in a few miles nearly every facies of the series, physical faunal, marine and continental, is visible in a manner not elsewhere available; and that the whole, situated like a hub of a wheel between major basins of the state, affords an unsurpassed control section for the Miocene." Even to the layman, the Cuyama Valley presents many interesting structural phenomena, and it is easy to im-

**Closeup of discovery well, above, with Dick Chamberlain, Richfield's district production foreman, and Petroleum Engineer Windy Payne checking gauges. Windy Payne was the one who escorted the writer over the Cuyama development.**

**Center photo shows George Dunn, Richfield's northern division construction foreman, and Ray Barker, drilling foreman for the same area—down from Taft to keep a watchful eye on the Cuyama developments.**

**Santa Maria Drilling Company's day crew—the lads who brought in the big Anderson-Colgrove 37-30 and 26-30. They are: Bob De Coursey, helper; Andy Blanco, driller; Ted Lewis, derrickman; Red MacLemale, pipe racker, and Ray Waldron, cathead.**

**Hoover Drilling Company's youthful looking day crew. These boys drilled the discovery well, are here shown at Russell B 11-8. They are: Charlie Reed, derrickman; Everett Hoover, driller; Vester Bishop, lead tongs; Clyde Bishop, cathead; Reatus Bishop, pipe racker.**

agine this trio of geologists, in fact, any trio of geologists, being thoroughly intrigued by its strange outcrops and unusual formations.

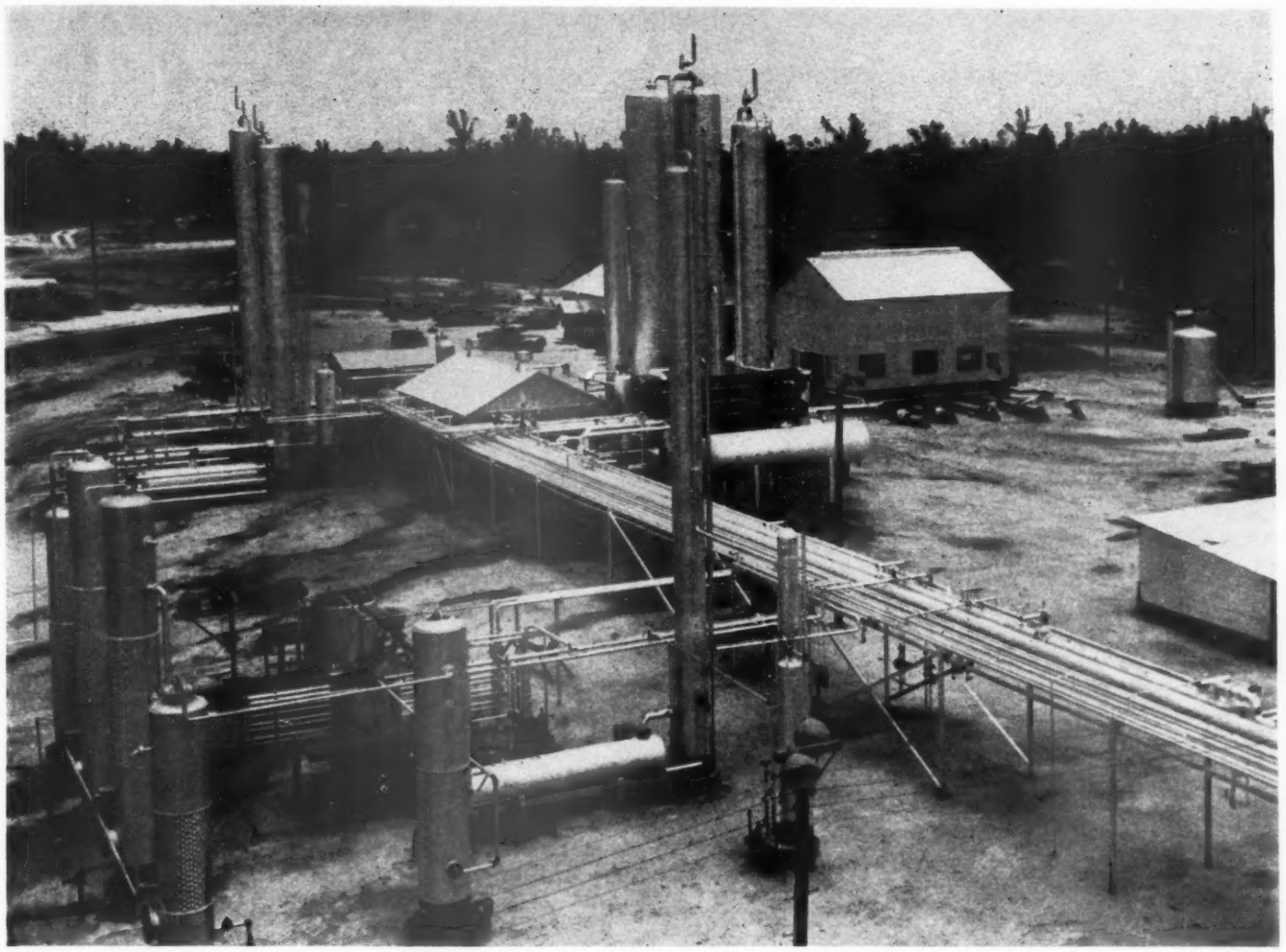
Speaking of the prospects for the occurrence of oil and gas in commercial quantities, and it must again be emphasized that the authors were speaking from the results of a surface examination only, they were not overly optimistic. They pointed out that up to the time of writing (1941), 11 wells had been drilled without success. It was further pointed out, however, that few of the wells were situated favorably as regards structure. The real basis for their lack of enthusiasm regarding the future possibility of production was in the seeming absence of large anticlines having sealed reservoir beds above a generative series. They reported two oil seeps, one in basal Temblor strata of the Caliente Range, about 2½ miles from Cuyama Ranch (the scene of the discovery well), and the other in Monterey strata in the bed of the Cuyama River, near Whiterock Bluff (close to the second producer).

Richfield is, with good reason, at the present time withholding all information on the geology of the field, but Vice President Frank Morgan, Rollin Eckis, and their aides, have evidently done a very good exploration job. As a matter of fact, they have established over the years an enviable reputation. North Coles Levee, discovered in 1939, is now producing about 17,000 bbl a day, and is the largest singly owned reserve in California with the exception of Elk Hills. It is reputed to be one of the most efficiently operated properties in the country, with a pressure maintenance system that is the last word. The company's extension of the Paloma field ¾ mile to the northwest, in May of this year, through its Miller & Lux well, a 1000-bbl producer, improved its own holdings to the extent of about 2100 acres, and added substantially to its reserves. Another interesting discovery, also in May of this year, was Coal Oil Canyon, near Wheeler Ridge in Kern County. These, together with the most recent Cuyama Valley discovery, are a pretty good indication that the Richfield exploration department is on its geological toes. With R. D. Montgomery, manager of exploitation, directing drilling and producing operations, it may be added that the exploitation end of the business has also been carried along smoothly and with notable success.

Needless to say, Richfield already has an aggressive development program under way for the new field. It projects the building of a pipe line to the company's Lake Station at Maricopa, some 30 miles distant, and the installation of adequate storage on the leases to take care of future production. At the moment, Anderson-Colgrove 37-30 has been pinched back to about 610 bbl a day, and this with the output of the Russell well is being hauled by Sargent & Lunsford tank trucks to Lake Station. The wells were drilled under contract — Russell A28-5, the discovery well, by Hoover Drilling Company, and Anderson-Colgrove 37-30, the second producer, by Santa Maria Drilling Company. As this is being written the same crews are now drilling new wells, the former being on A18-5, and the latter on Anderson-Colgrove 26-30. (This is the new 6000-bbl producer.) There are seven active drilling wells in the field of which five are Richfield wells. Company officials state, however, that this number will be considerably increased in the immediate future.

It is understood, incidentally, that all drilling on Richfield leases will be done by contract drillers. Three wells stand completed in the field as of June 30, 1948; a third one in addition to those mentioned being Norris Oil Company's Russell No. 1. This was bottomed at 2800 ft for 150 bbl of 20-deg API oil, and is obviously tapping a different zone from the two Richfield producers. There are seven wells actively drilling as of the same date, to wit: Anderson-Colgrove 26-30, a few hundred yards west of the first Anderson-Colgrove well; Russell B 11-8 and Russell A 18-5, close to the discovery well; Frank & Glahn's Indian No. 2, northwest of the Anderson-Colgrove wells, and Frank & Glahn's No. 58 in the same area; Russell B 31-8 on Section 8; and Cebrian Estate No. 1, on Sec. 23-11-28, San Luis Obispo County. Drilling contractors now operating in the territory are Hoover Drilling Company, Santa Maria Drilling Company, Gene Reid Drilling, Inc., Tracy Harkness and P. H. Frank, Inc.

Summing up this industrial adventure that is in reality just beginning, we commend it highly to the public relationists. In support of their "oil is progressive" slogan, they could not do better than look into the conduct of Richfield Oil Corporation since its reorganization in 1937. The entire history of the institution from the moment it was cleared of receivership to the present time has been a record of uninterrupted progress, in which the Cuyama Valley discovery is merely another step—and a very significant one. In the last 11 years, by fine executive direction and well planned exploration, the company has multiplied its reserves five times. * * *



A part of the Perco treating plant can be seen in left foreground, with processing columns in center and left background.

# Plant for LPG and natural gasoline

By FRANK H. LOVE, *Managing Editor*

EXCLUSIVE

OPERATION of an absorption type gasoline plant in the Atlanta field, Arkansas, by Hiwan Oil and Gas Company, is serving to increase the available supply of natural gasoline and LPG and is providing in usable form natural gas that otherwise would be a waste product due to its high hydrogen sulphide content.

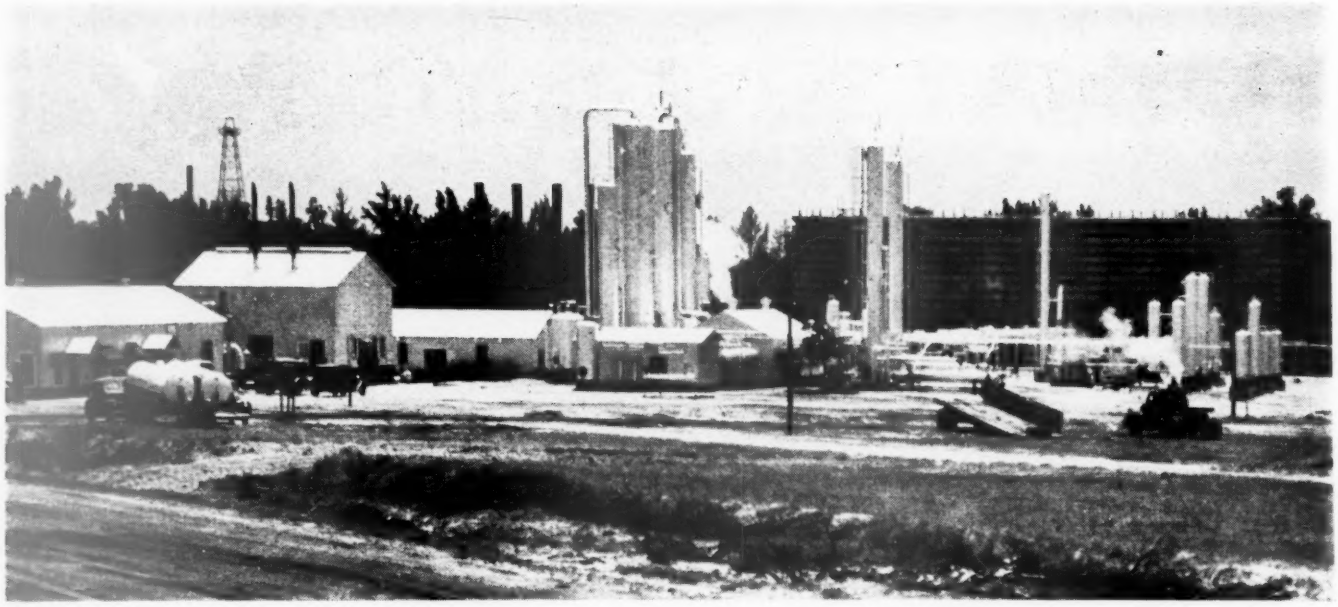
This plant, which is taking casinghead gas from 54 wells, is situated approximately 12 miles from Magnolia. Its capacity is 10,000,000 cu ft of gas a day, from which is recovered an 18-lb RVP gasoline and liquefied petroleum gas consisting of a 60-40 blend of propane and butane.

Although the installation for the most part is a conventional absorption type plant, features include the use of a recompressor to effect the condensation and utilization of all still vapors, and the operation of an ethane stripper to eliminate as much of the ethane, methane, and hydrogen sulphide as possible while retaining propane.

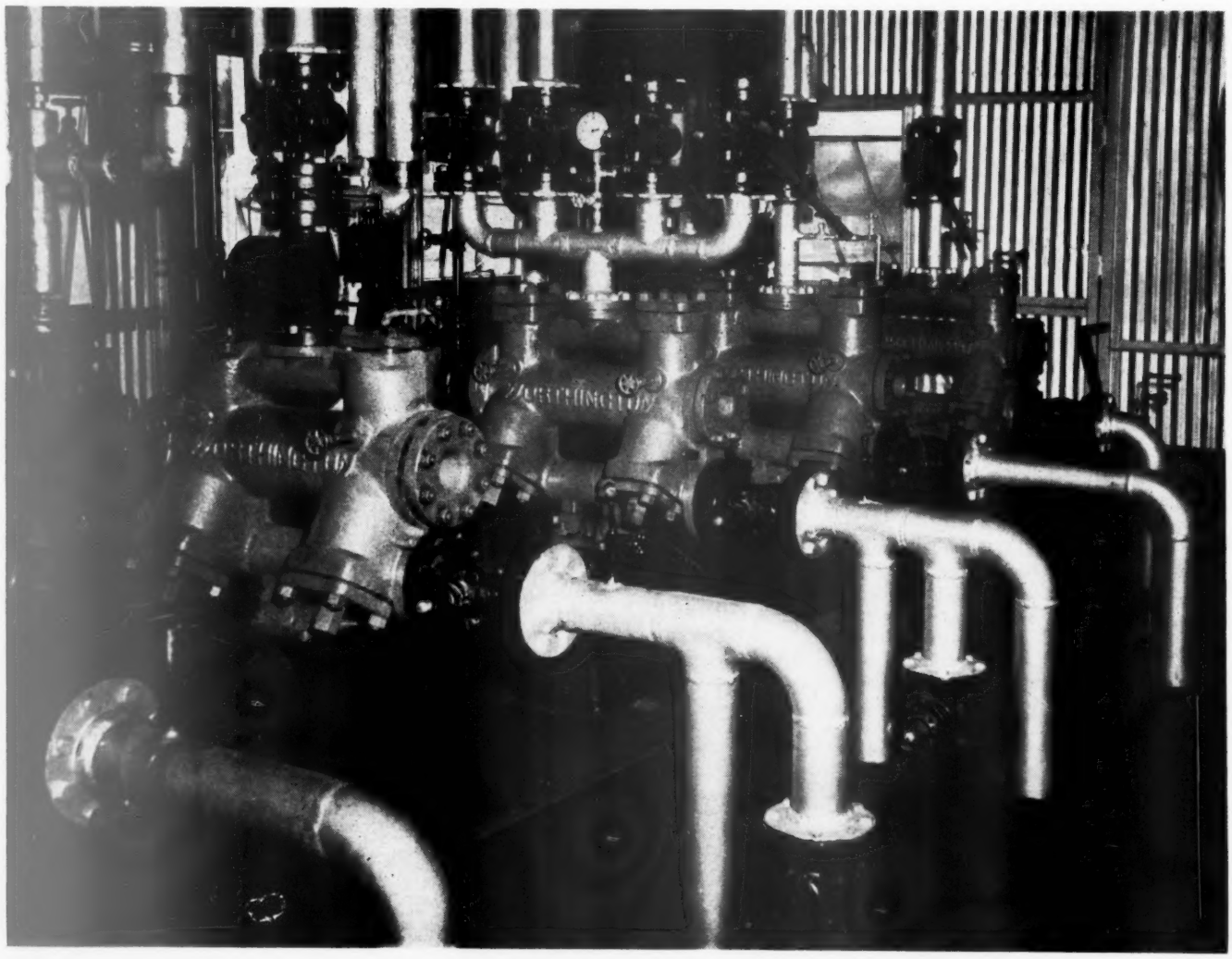
An operating problem is the large hydrogen sulphide content of the gas, which analyzes approximately 1600 grains per 100 cu ft. This must be reduced to a maximum of 4 grains in the LPG product; also, gas used as fuel at the plant and on leases must be treated in an amine desulphurization system.

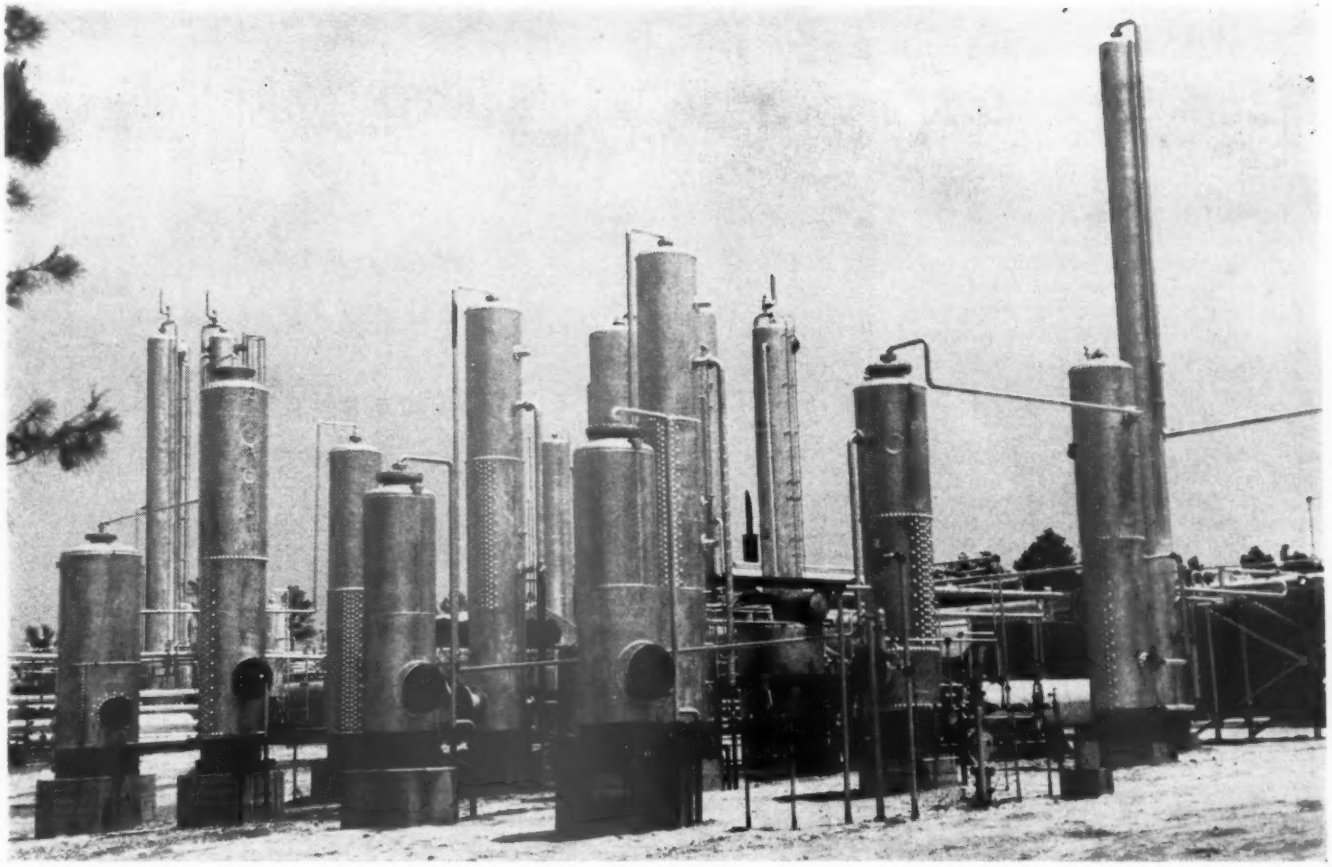
To describe the flow cycles, the casinghead gas is separated from the oil in the field, after which it is received at the plant through a primary and secondary scrubber before entering the 800-hp right angle type compressor unit. The secondary scrubber is equipped with a Mercoid switch to shut down the engine in event the fluid level becomes excessive. This is important because some wells produce salt water. The gas enters the compressor unit at zero pressure and is discharged at 50 psi to the low pressure absorber through which is circulated approximately 350 gpm of absorption oil.

Rich oil from the absorber is carried through heat exchangers into the ethane stripper on which is held a temperature of 330 F. Operation of this tower is designed to retain the propane and eliminate as much as possible of the methane.



Above, general view of the Hiwan Oil and Gas Company's absorption-type gasoline plant in the Atlanta field, about 12 miles from Magnolia. Capacity of the unit is 10,000,000 cu ft of casinghead gas a day, which is taken from 54 wells in the field. Plant equipment includes a recompressor to effect the condensation of all still vapors, as well as an ethane stripper to eliminate as much as possible of the ethane, methane, and hydrogen sulphide while retaining propane. A total of 22,000 gal of products is manufactured daily, 10,000 gal of LPG and 12,000 gal of natural gasoline. Below is a partial view of the pumphouse interior, which contains the process pumps and control board.





**An operating problem is the large hydrogen sulphide content of the gas, which analyzes about 1600 grains per 100 cu ft. This unit removes elementary sulphur from the 18-lb natural gasoline before it is sent to storage, and later pumped to refinery.**

ethane, and hydrogen sulphide. The oil stream then passes through a preheater and into the still, on which the temperature is 380 F. Hydrocarbon vapors come off the top of the tower and lean oil off the bottom to be recirculated.

The top vapors, containing gasoline, butane, propane, and remaining ethane and hydrogen sulphide, go to the cooling tower and are condensed, after which they enter a 40-psi raw surge tank. From this tank the raw make enters the rectifier charge tank. Vapors from the 40-psi surge tank are picked up by a recompressor and discharged through heat exchange to the rectifier charge tank. Thus all hydrocarbons that go through the distillation unit are charged to the rectifier column; there are no uncondensed still vapors. This is one of the features of the plant.

From the rectifier charge tank the stream is pumped to the rectifier column, the base temperature of which is 265 F and the top temperature 95-100 F. The rectifier column operates on the same principle as a depropanizer or deethanizer. Its principal function in this instance is to remove the remaining ethane and hydrogen sulphide, which come off overhead.

Bottoms from the rectifier—gasoline, butane, and propane — go through a caustic wash system before entering the debutanizer. The base temperature maintained on this column is 245 F and the top temperature varies from 110 to 135 F. LPG, a 60-40 blend of propane and butane, is taken off the top of the column, passed through another caustic wash, and sent to storage. The 18-lb gasoline that comes off the bottom is cooled and sent to a Perco treating unit for removal of elementary sulphur, after which it goes to storage.

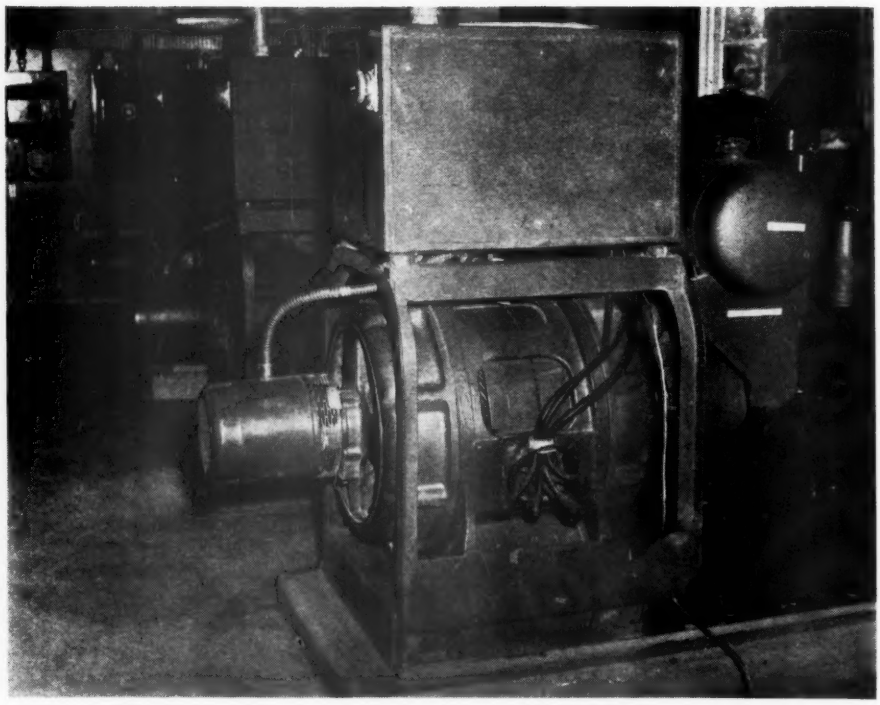
Electric power is being generated by three 25-kw generators driven by gas engines. Steam is provided by six 125-hp

**Cottages provide living quarters for the plant's key operating personnel as plant is 12 miles from sizeable town.**

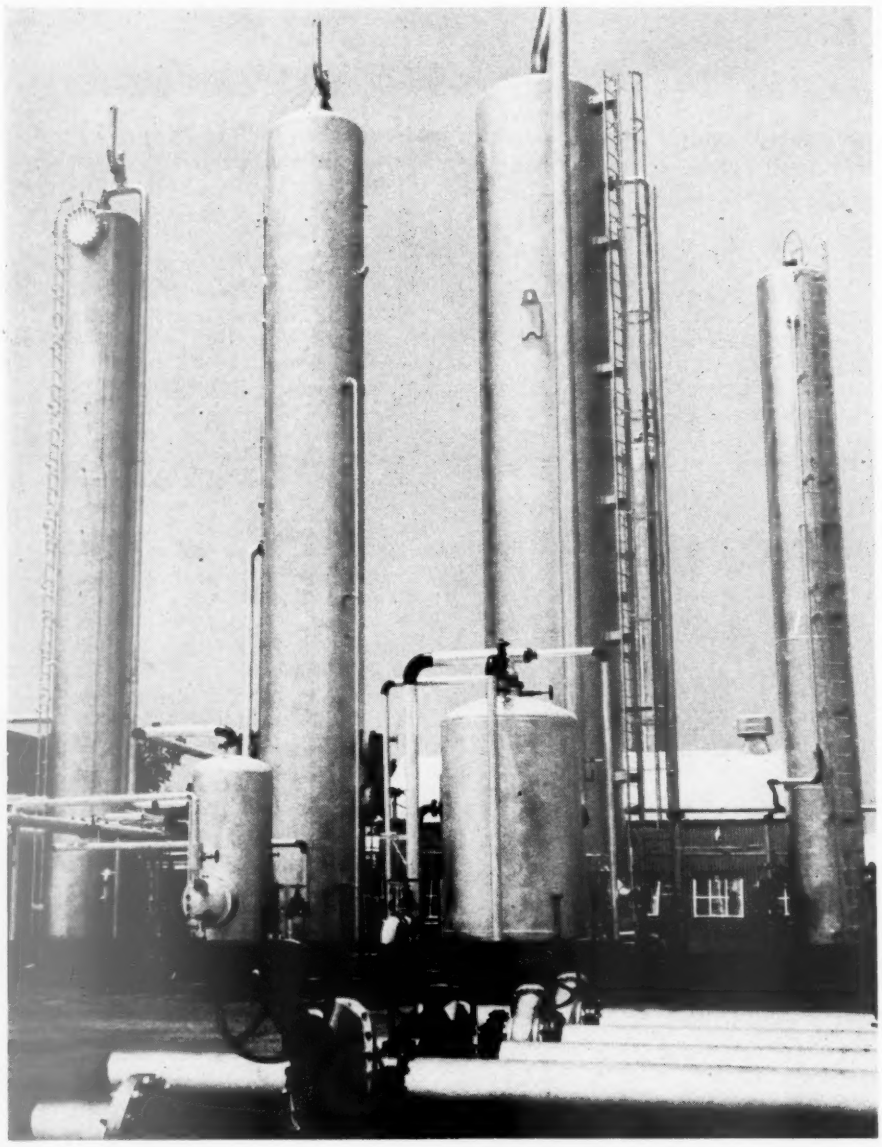
boilers. Two water wells have been drilled, which together have a capacity of 200 gpm. This is ample as the plant's consumption is approximately 100 gpm. Inasmuch as the water has a hardness of about 10 grains, it is treated for removal of iron and other elements before use.

The plant is manufacturing approximately 22,000 gal of products a day. These consist of 10,000 gal of LPG and 12,000 gal of natural gasoline. Storage capacity has been provided for 60,000 gal of natural gasoline and 60,000 gal of LPG. Gasoline production is pumped through a 2-in. line to the Lion Oil refinery at El Dorado by a steam-driven duplex pump operating at 700-psi pressure. The LPG has been contracted locally and is trucked out, a loading rack being provided for this purpose.

In the near future it is expected to convert the plant to two-stage operation. Another 800-hp right angle compressor will be added, as well as certain other



**Electric power is provided by three 25-kw generators driven by gas engines.**



**Processing towers that are the heart of this plant, which manufacturers natural gasoline and a propane-butane blend.**

**Analysis of residue gas.**

| Component— | Mol % |
|---|---|
| Carbon dioxide | 2.30 |
| Nitrogen | 3.00 |
| Hydrogen sulphide | — |
| Methane | 88.23 |
| Ethane | 4.23 |
| Propane | 1.74 |
| Isobutane | 0.27 |
| *N*-butane | 0.23 |

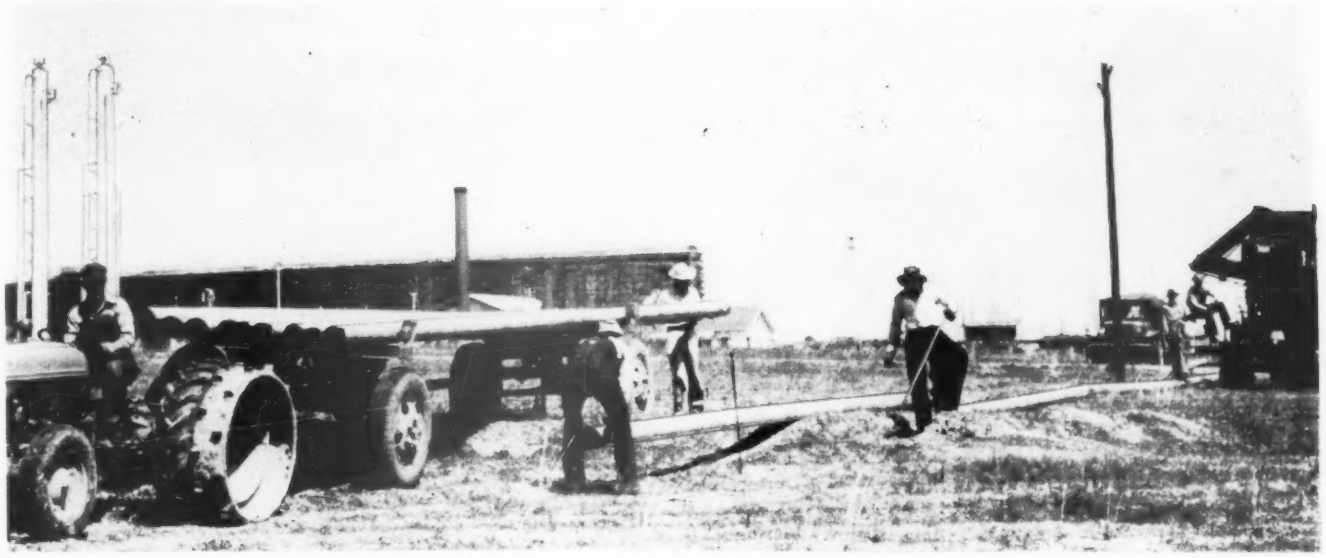
**Analysis of incoming gas.**

| Component— | Mol % |
|---|---|
| Carbon dioxide | 1.75 |
| Nitrogen | 3.60 |
| Hydrogen sulphide | 2.04 |
| Methane | 80.79 |
| Ethane | 3.02 |
| Propane | 3.68 |
| Isobutane | 1.55 |
| *N*-butane | 2.10 |
| Isopentane | 1.53 |
| *N*-pentane | 0.58 |

Note: Recovery is approximately 2 gal per M cu ft of gas.

necessary equipment, and the absorption system will operate at a pressure of 250 psi When the plant goes to high pressure operation approximately 7,000,000 cu ft of gas a day will be sold to the Arkansas Louisiana Gas Company. This gas will leave the Hiwan plant at a pressure of 250 psi, will be received at 180 psi by the plant of the Arkansas Fuel Oil Company, an affiliate of Arkansas Louisiana Gas Company, and discharged through its plant. Sour gas will be delivered, which will be treated at the Arkansas Fuel Oil plant.

The Hiwan plant was designed and constructed by Petroleum Engineering, Inc., Houston, Texas. ★ ★ ★



Pipe wagon and ditcher (far right) preceded welding outfit on this two-mile aluminum pipe line job at Magnolia, Arkansas.

# Inert-gas-welded aluminum pipe line to carry "sour" oil

PHOTOS COURTESY HOBART BROTHERS COMPANY

All beveled edges of the aluminum pipe were cleaned with steel wool.

Gasoline engine driven rotary alternating current arc welder with built-in high frequency, water and automatic gas valve, provided current to do pipe line job.

A TWO-MILE aluminum pipe line, all inert-gas-welded, was recently completed at Magnolia, Arkansas, by the Interstate Pipe Line Company, a Standard Oil subsidiary. The purpose in using this aluminum pipe was to prevent corrosion caused by "sour" oil. "Sour" oil contains hydrogen sulphide and some water, and these combine to form an acid that eats away the pipe. Samples of oil pipe removed after a year's use showed badly corroded areas.

The aluminum pipe used on this job was 40 ft long and 6 in. in diam with a 0.280-in. wall thickness. The pipe was made from 63 ST6 aluminum. All ends of the pipe were beveled 52½ deg so that the welds would penetrate the entire thickness of the pipe. A filler rod

**Pipe was clamped in line and tack welded in four or five places to hold in position for welding. Note shields to keep the argon gas from blowing away.**

**Roll welding the aluminum pipe—complete weld is made in downhand position.**

of 3/16 in. No. 43S bare aluminum was used, and a light duty water-cooled torch and 5/32-in. tungsten electrode provided the arc and argon gas.

A gasoline engine driven a-c welder with built-in high frequency provided the high heat input necessary. This welder was built primarily for using the inert-gas-welding process in places where normal power supply is not available and consists of a gasoline engine driven a-c generator with a welding range of 60 to 450 amp. It has a high frequency stabilizing device, which is required for inert-gas-welding. As the torch used in this process must be water cooled, the unit is equipped with a water circulating system to cool the torch. It also is equipped with an automatic magnetic valve for turning the argon gas on and off.

The first test weld was done in position using a stainless steel backing strip. This backing strip is of the collapsible type that can be removed after each weld is made. The two connecting lengths of pipe were lined up with a clamp and tack welded together using 5 welds 1½ to 2 in. long. The clamp was then removed and welding was begun at the bottom of the pipe and welded up both sides to the top. Two passes were required to weld the joint and allow a 3/32-in. reinforcement. The welding time on this joint was as follows:

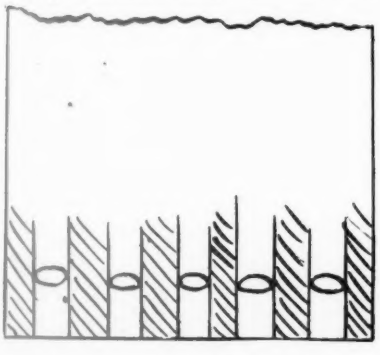
| | |
|---|---|
| Positioning back up strip, lining up and tacking | 10 min |
| Welding first pass | 9 min |
| Welding second pass | 12 min |
| Total time for first joint | 31 min |

The second test weld was a roll weld, and after lining up and tacking, which took approximately the same length of time as the first joint, the joint was welded in two passes as the pipe was rolled. Roll welding the two passes required only 14 min as compared to 21 min by the other method. ★★★

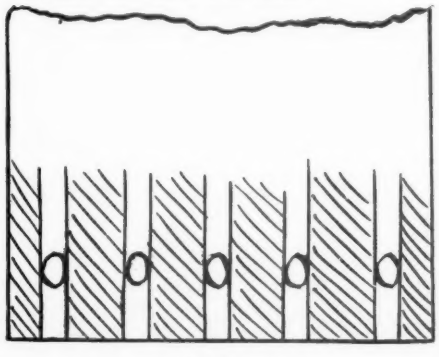
## How to punch belt lacing holes

By W. F. SCHAPHORST

THESE two sketches show the wrong and the right way to punch holes in a belt preparatory to lacing. Oblong (elliptical) holes are preferable to round holes, but they must be punched in such a way that the "long" axis of the hole lies parallel with the belt. In this way the more useful belt is left to do the work as indicated by the shaded areas in the sketches. There is considerably more shaded area where the method is right than where it is wrong.



WRONG



RIGHT

It will be noted that by exaggerating the punched holes, about as the figure shows, making the holes much longer than wide, nearly one-half of the belt has been cut away, thus reducing the strength of the belt to 50 per cent. That, of course, reduces the belt's pulling power by 50 per cent. Exaggerate it still more and the whole belt could be cut in two thereby giving it no strength at all. However, by turning the punch through 90 degrees, as shown by the sketch marked "right," maximum strength is obtained.

The efficiency of a belt joint is computed in the same way that the efficiency of a boiler joint (riveted) is computed. In both cases it is best to cut away as little of the stressed material as possible. That is, make the area of the stressed section shown in the sketches as great as possible. ★★★

# Safe practices in using fiber rope

By DON ATTAWAY, *Safety Engineer*, Arkansas Fuel Oil Company

ALMOST any person with long experience in oil and gas operations has seen accidents result from fiber rope failure or misuse. No reliable record is available on just how many mishaps occur due to improper use of rope, because such accidents are usually classified under other accident agencies.

EXCLUSIVE

Often the physical condition of the rope is the direct cause of a costly accident, but in many cases the lack of knowledge on the part of the workman causes an unsafe act that produces the mishap.

● **Kinds of rope.** Safety in the use of any rope begins with the selection of the fiber. There are three types of fiber rope.

1. Manila fiber.
2. Sisal fiber.
3. Bast fiber.

A good grade of manila fiber rope when new and clean is hard but pliant, yellowish in color with a silvery or pearl luster. It has a smooth almost silky feel. Manila fiber comes from a plant of the same family as the banana, and being of a cellulose base it is seriously affected by bacterial growths. In manufacturing, the fiber is treated to resist these conditions. A finished rope with a dark color indicates fibers of an inferior grade. Brown or black fibers are weak and often dangerous.

A good grade of sisal rope when new and clean is of a yellowish white color with sometimes a greenish tint. It does not have the gloss of a manila rope and the fibers are stiff and have a tendency to split. The rope feels rough when drawn through the hand.

A good grade of bast fiber rope when new has a dark grey color and is much softer than manila rope. As this rope is made from the bark of a tree, it is often called black hemp.

Sometimes there is doubt regarding what fiber is in a rope. One way to test is to cut a 12-in. sample from the rope and separate it into strands. The oil may be washed out with alcohol or ether and the strands immersed in a bleaching solution acidified with acetic acid. After immersing for 30 min, the sample is washed in water, then in alcohol, and shaken until dry. Exposing the prepared sample to ammonia fumes will cause the fibers to change color. If the fibers are brown, the rope is manila. If the fibers are cherry red, the fibers are hemp or sisal.

● **Care of rope—uncoiling.** The most important factor in rope safety is care and precaution in using rope. So many items of care directly affect the safety of a rope that many of them are often overlooked or neglected.

Rope manufacturers report many cases where rope sustained irreparable damage because instructions for opening and uncoiling were disregarded.

Rope comes coiled in different directions because the rope may be right lay, left lay, or cable lay. The difference may be seen by holding a piece of the rope in front of you. If the strands run up to the right, it is right lay. If the strands run up to the left, it is left lay. Cable is made up of three right laid ropes laid up left handed.

When a coil of rope arrives at your job, the inner end is tied to the lashing and tagged. The rope should always come out of the eyes of the coil, not from the outside. A right lay rope will uncoil in a counterclockwise direction, but a cable or left lay rope will uncoil in a clockwise direction.

In the event the rope does not follow this rule in uncoiling, do not figure an error has been made and continue to uncoil the rope.

The solution is found by simply capsizing the coil and drawing the rope end back through the eye.

Rope is coiled in this fashion for a definite reason. It makes it possible to uncoil the rope without removing the burlap covering—only the lashings. The burlap will protect and keep the rope clean.

● **Kinking.** A moderate strain on a rope that is kinked may overstress the fibers at the point of the bend. As a safe practice, kinking must be avoided. Kinking is more likely to occur when a rope is wet because of rope shrinkage and swelling of fibers with consequent shortening of the lay.

In taking out kinks, rather than stretch the rope along the floor and untwine the coil, roll the rope up left-handed and when you reach the end of the rope, pass the end down through the center of the coil and then coil the rope right-handed. This is the quickest way to take out kinks.

● **Cleaning.** Extra dirty ropes should be cleaned. To do this, hang the rope in loops over a beam or bar at head height. The sand and mud can be washed away with a water hose. Do not use a high pressure stream as the grit particles may be driven into the fibers. After the rope has been allowed to dry, it may be shaken or beaten with a pliable switch or broom to release sand or dirt.

● **Moisture.** Rope deteriorates very rapidly when saturated with water. For that reason, ropes used in construction work become weak and unsafe unless they are properly cleaned and dried.

Ropes should not be allowed to freeze after becoming wet, as frozen rope breaks easily.

● **Storage.** The effects of temperature and humidity on rope are such that it becomes very important from a safety angle to be sure that rope is stored properly. The perfect storage temperature is 70 F with 65 per cent relative humidity.

Storage in either extremely wet or dry places produces rot. Rope should be kept on a platform or grating to allow thorough circulation of air, and away from steam pipes and radiators. The practical storage place is any unheated building with protection from direct sun rays, rain, snow, and acids.

Strong alkali is injurious to rope and acid fumes damage rope fibers. Even paint is detrimental to rope service.

● **Causes of failure—overload.** Ropes of different sizes have definite safe load limits. Rope will lose strength rapidly when it is subjected to repeated overloads and sudden strains. The safe load limits are shown in Table I.

Under normal tension the internal friction is not too great, but sudden strains often fracture the center yarns. This condition is difficult to detect. It is a safe practice to retire a rope that has been subjected to known extreme overloads. It can still be used for lashing and similar work where personal safety is not involved.

Sometimes internal friction will take place at the strand axis and may be detected by opening the rope where powdering is found.

● **External wear.** Dragging rope over rough or sharp surfaces causes abrasions and actually cuts the external fibers. Rope pulled along the ground picks up sand and grit that works its way into the fiber and cuts the strands.

Ropes should never be carried in tool boxes or truck compartments with heavy or sharp edged tools.

Surface wear of a rope occurs when the sheave holes in blocks are too small to permit ample clearance.

Never use rope over blocks with cracked and broken shells or sheaves. Misalignment of blocks or sheaves should be avoided.

Any sharp bends over an unyielding surface should be avoided. They cause extreme tension on the strands. In selecting an object to make a rope fast, choose an object with a round smooth surface of sufficient diameter. If the object has sharp edges or corners, pads of burlap or bagging must be placed between the rope and the load.

● **Inspection.** Routine inspection of rope must be part of a supervisor's re-

sponsibility. New rope, especially, should be examined to see that it is clean, safe, and sound. If the rope is to be used in electrical work, no metallic strands should be in the rope, as they will expose workmen to electrocution.

Used rope should be inspected at intervals of no longer than 30 days. Rigging involving human loads should be tested to *three times* the weight it will carry in service; however, the test load should not be more than 3 ft off the ground when the test is made.

Visual inspection means examining the rope throughout its entire length.

Signs of external wear, broken or cut fibers, displacement of strands, variation in size or roundness, discoloration, or rotting should be noted.

The following procedure is of assistance in determining the safety of a rope:

(a) Look for cuts and broken fibers on the outside.

(b) Untwist the rope in several places to inspect the inner fibers. If the inner yarns are bright and unspotted, the rope is good.

(c) Unwind a piece of yarn about 8 in. long and break with the hands. If it breaks easily with little effort, the rope is unsafe.

(d) Rope used around acid and caustic should be inspected frequently. If black or rusty brown spots appear, the rope is damaged.

(e) A rope that has lost its stretch and in which the fibers are dry and brittle should be viewed with suspicion and replaced by a new rope. This is very important if there is a possibility of injury to workers or damage to property.

(f) Any suspicious soft spots, signs of powdering or burned and decayed sections in rope are enough to justify a replacement. A rope is only as stong as its weakest spot.

● **Preservatives.** During rope manufacture, the fibers are treated with an oil to preserve them and lubricate the internal fibers. This lubricant should never be more than 8 to 12 per cent of the rope weight and no substance should be added for the purpose of loading or weighting the rope. A preservative, however, should be applied from time to time to transmission rope to keep it in proper condition and to obtain the maximum service. Graphite and tallow are often used but too much lubricant should be avoided as an excess will cause slipping.

**TABLE 1. Standard manila rope (3 strand).**

| Diameter, in. (approximate) | Weight per foot, lb (maximum) | Breaking strength, lb (minimum) | Safe load, lb |
|---|---|---|---|
| 3/16 (6 yarns) | 0.015 | 450 | 90 |
| 1/4 (6 yarns) | 0.020 | 600 | 120 |
| 5/16 (9 yarns) | 0.029 | 1,000 | 200 |
| 3/8 (12 yarns) | 0.041 | 1,350 | 270 |
| 7/16 (15 yarns) | 0.053 | 1,750 | 350 |
| 1/2 (21 yarns) | 0.075 | 2,650 | 530 |
| 9/16 | 0.104 | 3,450 | 690 |
| 5/8 | 0.133 | 4,400 | 880 |
| 3/4 | 0.167 | 5,490 | 1,080 |
| 7/8 | 0.195 | 6,500 | 1,300 |
| 1 | 0.225 | 7,700 | 1,540 |
| 1 1/16 | 0.270 | 9,000 | 1,800 |
| 1 1/8 | 0.313 | 10,500 | 2,100 |
| 1 3/16 | 0.360 | 12,000 | 2,400 |
| 1 1/4 | 0.418 | 13,500 | 2,700 |
| 1 5/16 | 0.480 | 15,000 | 3,000 |
| 1 1/2 | 0.690 | 18,500 | 3,700 |
| 1 5/8 | 0.744 | 22,500 | 4,500 |
| 1 13/16 | 0.895 | 26,500 | 5,300 |
| 2 | 1.08 | 31,000 | 6,200 |
| 2 1/4 | 1.46 | 41,000 | 8,200 |
| 2 5/8 | 1.91 | 52,000 | 10,400 |
| 3 | 2.42 | 64,000 | 12,800 |

Ropes used by fishermen and boats are often treated with copper nathanate or oleate to prevent bacterial growth but ropes used in hoisting should not be tarred or lubricated with any chemical that would tend to cause dirt, grit, or other particles to stick to the surface.

Some companies, such as bridge builders, request flame-proofed rope for life nets. This is a safe practice to protect the rope from hot rivets.

Many industries require pine tar treated rope as a safety factor. Under certain conditions this is recommended.

● **Fastenings.** The safety of an operation where rope is used depends a great deal upon the splice, knot, or hitch used. Only accepted methods of knotting should be used. One reason why rope fails so often at a fastening is because each yarn and strand in the standing part of the rope bears its proper share of the load, but in all fastenings the rope is more or less cramped, distorted, or has a sharp bend. This places an overload on the yarns affected and they part until the cramping is overcome. If the effect is prolonged, the rope is stranded and then parts.

The following table gives the results of a series of tests to determine the efficiency of a manila fiber rope used in some well known knots and hitches.

| *Condition* | *Efficiency, %* |
|---|---|
| Full strength—dry rope | 100 |
| Eye splice over iron thimble | 90 |
| Short splice in rope | 80 |
| Timber hitch | 65 |
| Half hitch | 65 |
| Bowline | 60 |
| Clove hitch | 60 |
| Slip knot | 60 |
| Square knot | 50 |
| Weaver's knot | 50 |
| Overhand knot | 45 |

There are unlimited knots, bends, and hitches but many of them are unreliable. For instance, the granny knot is frequently tied by mistake for a reef knot and is useless and dangerous. The half hitch single is usually not dependable. The thief knot will not hold and the slip knot can be used only on light loads.

● **General.** Safety to life and limb requires that rope be properly used and well cared for. It is a valuable tool but a potent death weapon.

The primary safe practices listed below are well worth observing if rope accidents are to be avoided.

1. Under no circumstances use rope in a doubtful condition.

2. Instruct workmen in proper methods of handling rope with a definite program of safe fastenings for various operations and insist that these fastenings be used. Failure of knots, hitches, and splices cause many serious accidents.

3. Know the weight of your load and use the proper size of rope. Avoid jerks, strains, and jars, especially on first lifting.

4. Clear all kinks and twists out of your rope. Store it properly and inspect it frequently.

This article cannot cover all the technical safety details of using fiber rope and is intended only as a guide. Supervisors and workmen interested in more exact specifications on rope should consult rope manufacturers or refer to the "Federal Specifications for Rope, Manila" TR 601 published by the Federal Specifications Board, Washington, D. C.

● **Reference**

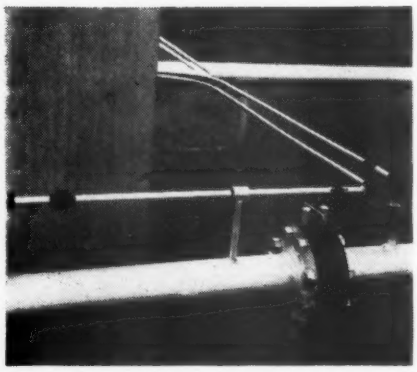

1. Safe Practice Pamphlet No. 6, National Safety Council, Chicago, Illinois.
2. "Inside That Coil of Rope" by Capt. A. R. Hatch, *National Safety News*, February, 1948.


★ ★ ★

# METER LINE SUPPORT RELIEVES PRESSURE

Spacing of the two pressure taps on a high-pressure gas line must be the correct distance upstream and downstream to give readings that will check with the characteristics of the meter. Such lines must be supported to relieve the connecting unions of all but pressure loading.

In the Carthage field, Texas, one producer sets the meter house with one edge flush with the orifice plate, and brings both leads in with wide sweeping curves. The long leg is supported in a bracket, welded to the gas flow line. The top of the bracket is a pipe collar, of the next size above that used for the line. The pipe can be turned easily in this support, but cannot get out of line.



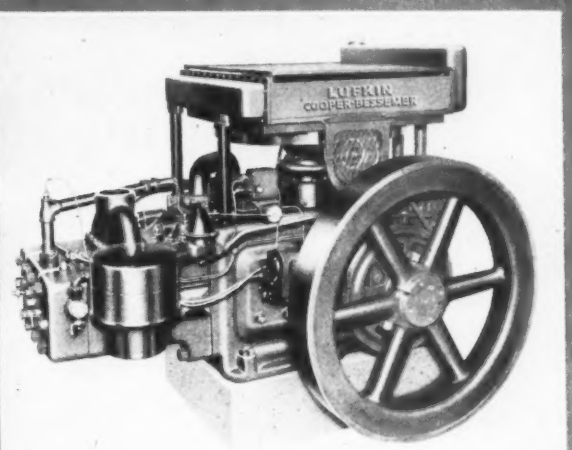
When such a line is made up, the ell is screwed onto the pipe with the long sweep bend, and the piece that parallels the flow line then rotated inside the support to make up the other thread in the ell. The union is then tightened, making the whole line rigid.

An assembly such as the one illustrated relieves the meter of vibration that may sometimes occur in the flow line and gives the meter and its connections the fullest protection. ★ ★ ★

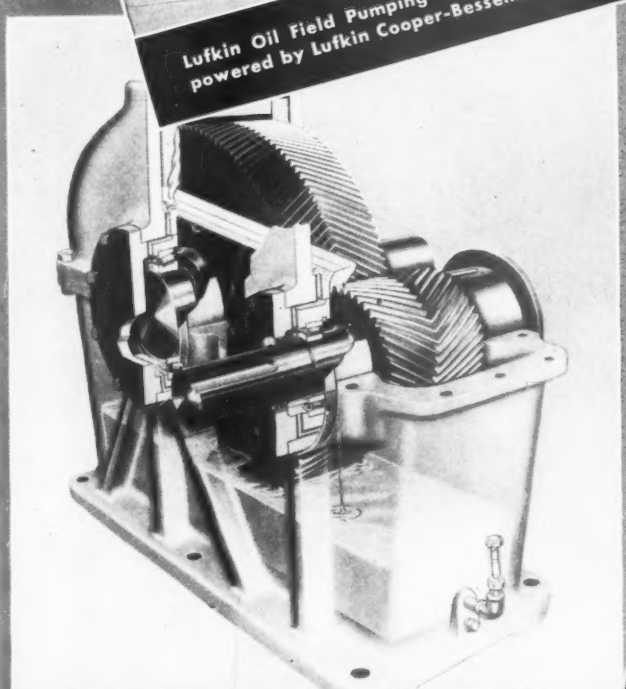
# LUFKIN

## PRECISION PRODUCTS FOR THE OIL INDUSTRY . . .

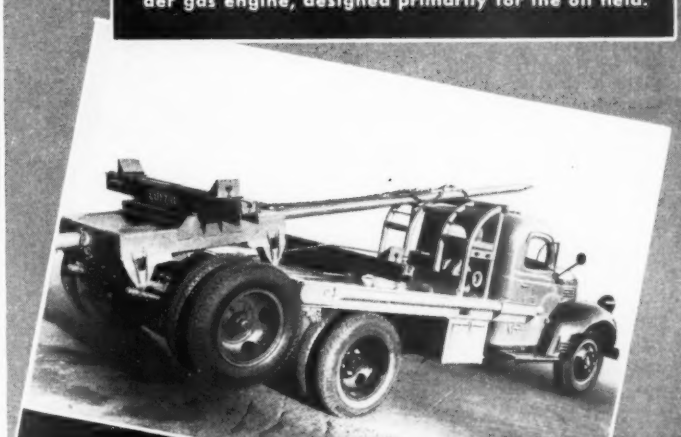
Lufkin Oil Field Pumping Unit built in sixteen sizes, powered by Lufkin Cooper-Bessemer Gas Engine.




Lufkin Cooper-Bessemer G5DH Horizontal two cylinder gas engine, designed primarily for the oil field.



Phantom and cut-away illustration showing lubrication system of Lufkin single reduction Herringbone Gear Reducer in excess of 60,000 complete sets now in use since 1923. A copy of our new Gear Catalog will be mailed upon request.



Lufkin General Purpose Oil Field Truck bed complete with Lufkin Winch, Pipe Trailer and Accessories.

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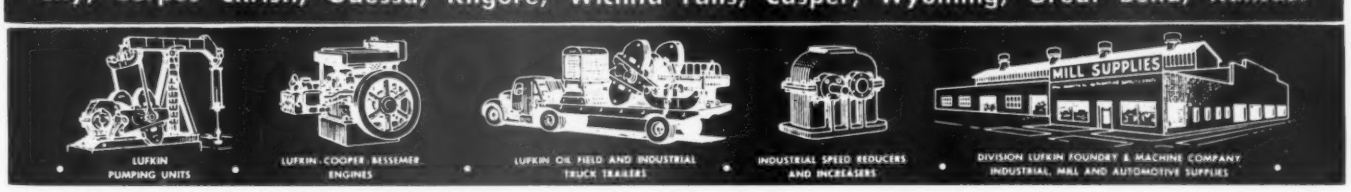



LUFKIN PUMPING UNITS • LUFKIN-COOPER-BESSEMER ENGINES • LUFKIN OIL FIELD AND INDUSTRIAL TRUCK TRAILERS • INDUSTRIAL SPEED REDUCERS AND INCREASERS • DIVISION LUFKIN FOUNDRY & MACHINE COMPANY INDUSTRIAL, MILL AND AUTOMOTIVE SUPPLIES

General view of San Juan at twilight. Seapower supplies electricity for most of the city's illumination.

# Oil burning floating powerhouse

PUERTO RICO'S growing number of industrial plants are relying heavily upon an oil-burning steam power plant moored about three miles from San Juan, capital of the island. Known as the "Seapower," the sea-going powerhouse provides 720,000 kwhr daily, about one-third of present requirements.

The craft burns approximately 50,000 gal of fuel a day, and can operate for an entire week on one filling of its tanks. Other plants on the island supply the remaining power needed to turn the wheels of the numerous industries that recently have come to Puerto Rico.

Cost of the floating powerhouse was relatively low compared with other methods of power generation. It was originally built for the U. S. Army at a cost of $4,500,000. During the Battle of the Bulge, the "Seapower" was berthed at Ghent, Belgium, supplying power for the rear echelons, which served supply and repair depots.

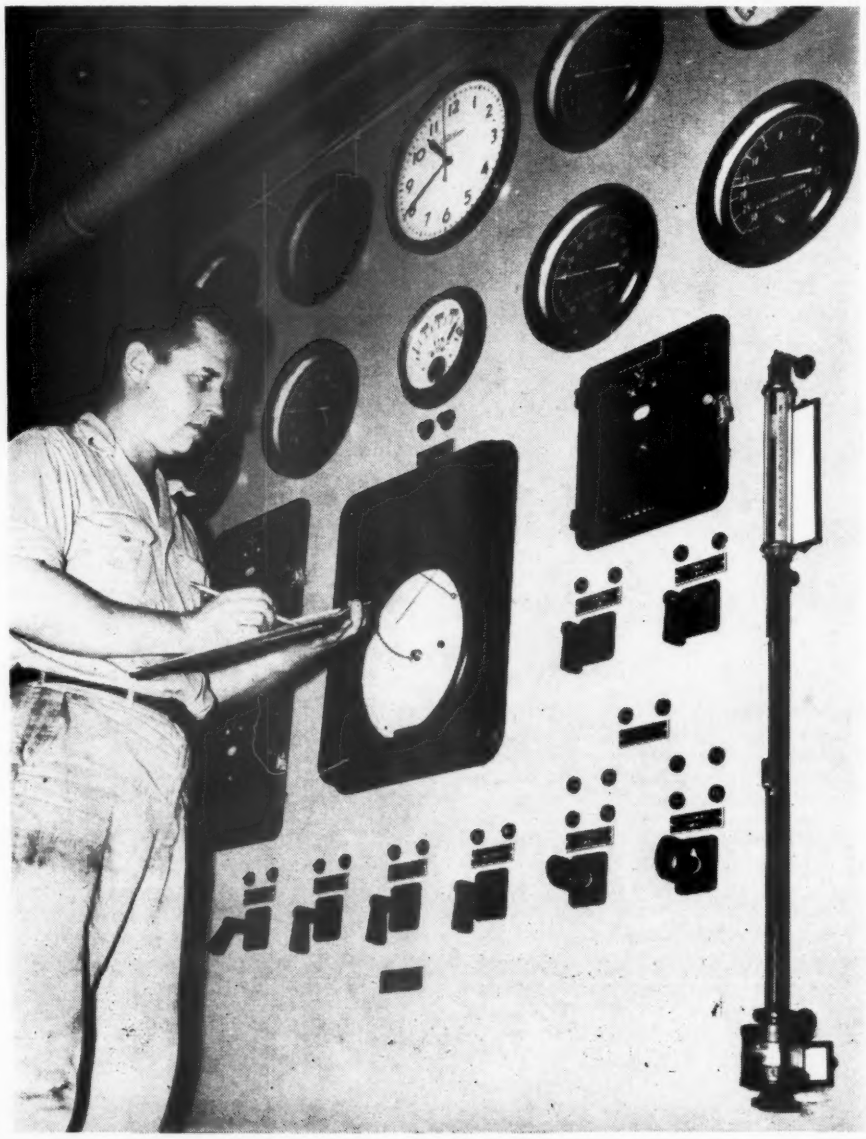
The craft is 358 ft long, with a beam of 50 ft and a displacement of 5500 ft. about half that of Liberty ships. It has been equipped with the most modern power producing machinery, and can evaporate sea water for its boilers, if needed.

By itself, the ship can produce enough electricity for San Juan's 200,000 residents, and it constitutes one of 18 power units linked to the present system serving all of Puerto Rico.

Wartime restrictions had greatly hampered efforts of the Puerto Rico Industrial Development Company, a government agency, in promoting, developing and building a diversified industrial economy for the island. The "Seapower," which was obtained from the War Assets Administration at a cost of $2,500,000, has proved a boon to homes and industries in San Juan.

Such a floating powerhouse could well be of interest to those engaged in drilling and producing operations in the Gulf of Mexico or other bodies of water. ★ ★ ★

Paul Isaacson, a former GI who served ship at Ghent and is now watch engineer, checks a control board. Craft normally requires crew of 50 on four 6-hr shifts.



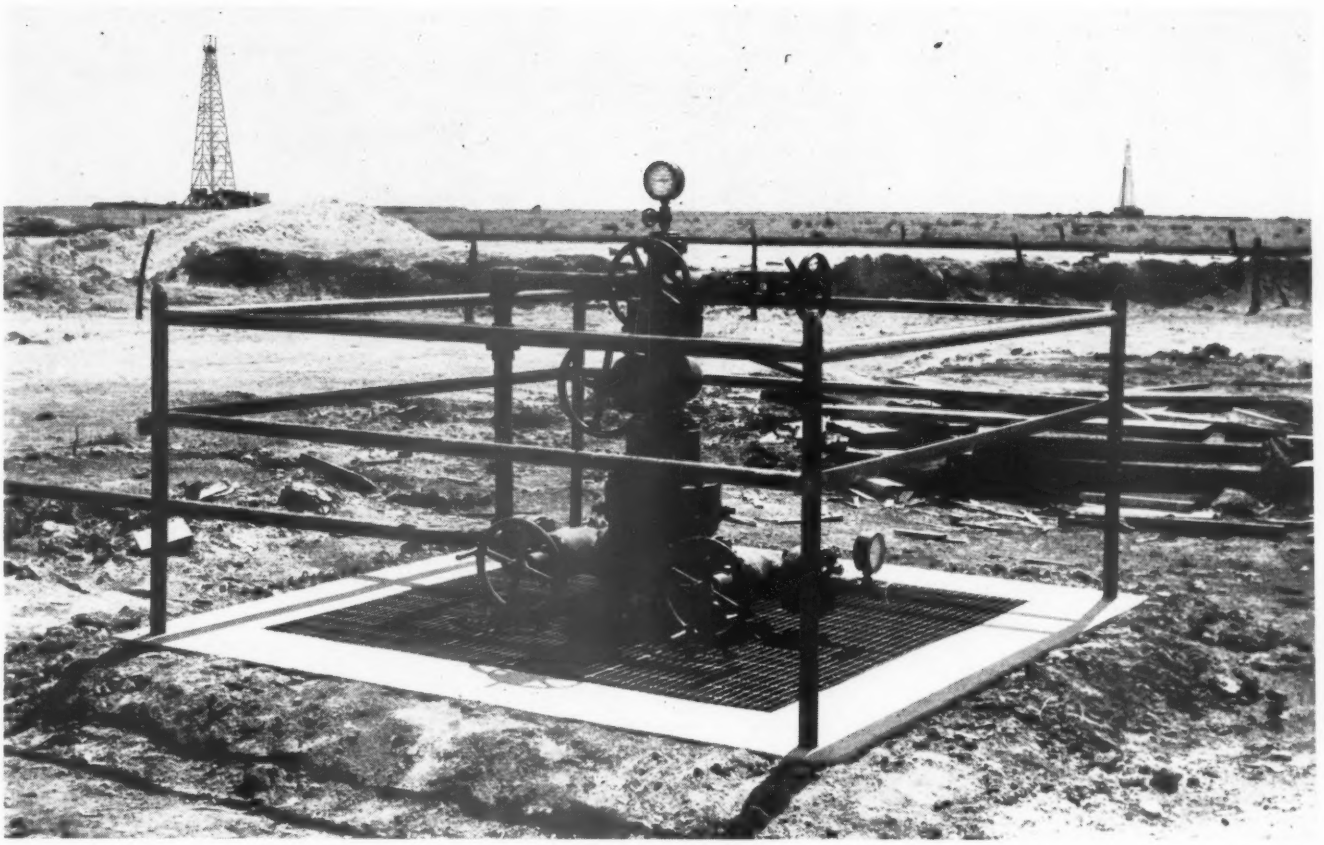


FIG. 1. Welded pipe guards are placed on concrete apron around wellhead connections of Mid-Continent's new discovery well of the Crossroads oil field of north Lea County, New Mexico. The well can produce about 170 bbl of 42 API gravity oil per hr through a ¾-in. choke, and has a rated capacity of more than 4000 bbl per day. It is now allowed to produce 500 bbl per day. Mid-Continent's southwest offset drilling well can be seen at the upper left, and Skelly's southwest outpost can be seen at the upper right. A vast area on the Northwestern Shelf of the Permian Basin has been opened by the new well.

# Drilling problems in new Crossroads field

By K. MARSHALL FAGIN, *Field Editor*

**EXCLUSIVE**

With little more to encourage them than a geophysical picture and a rainbow of oil on top of the mud in a drill stem at 4882 to 4950 ft in the San Andres, the officials of the Mid-Continent Petroleum Corporation drilled their U. D. Sawyer "A" No. 1, a rank wildcat in north Lea County, New Mexico, to a total depth of 12,258 ft and completed it on May 7, 1948, as the discovery well of the new Crossroads field. The initial oil production from the Devonian formation between 12,115 and 12,215 ft was 995 bbl in 6 hr and 20 min through a ¾-in. tubing choke. The well has now cleaned itself up and can be flowed at the rate of about 170 bbl of clean 42 API gravity oil per hr through a ¾-in. choke, indicating a potential of about 4000 bbl per day.

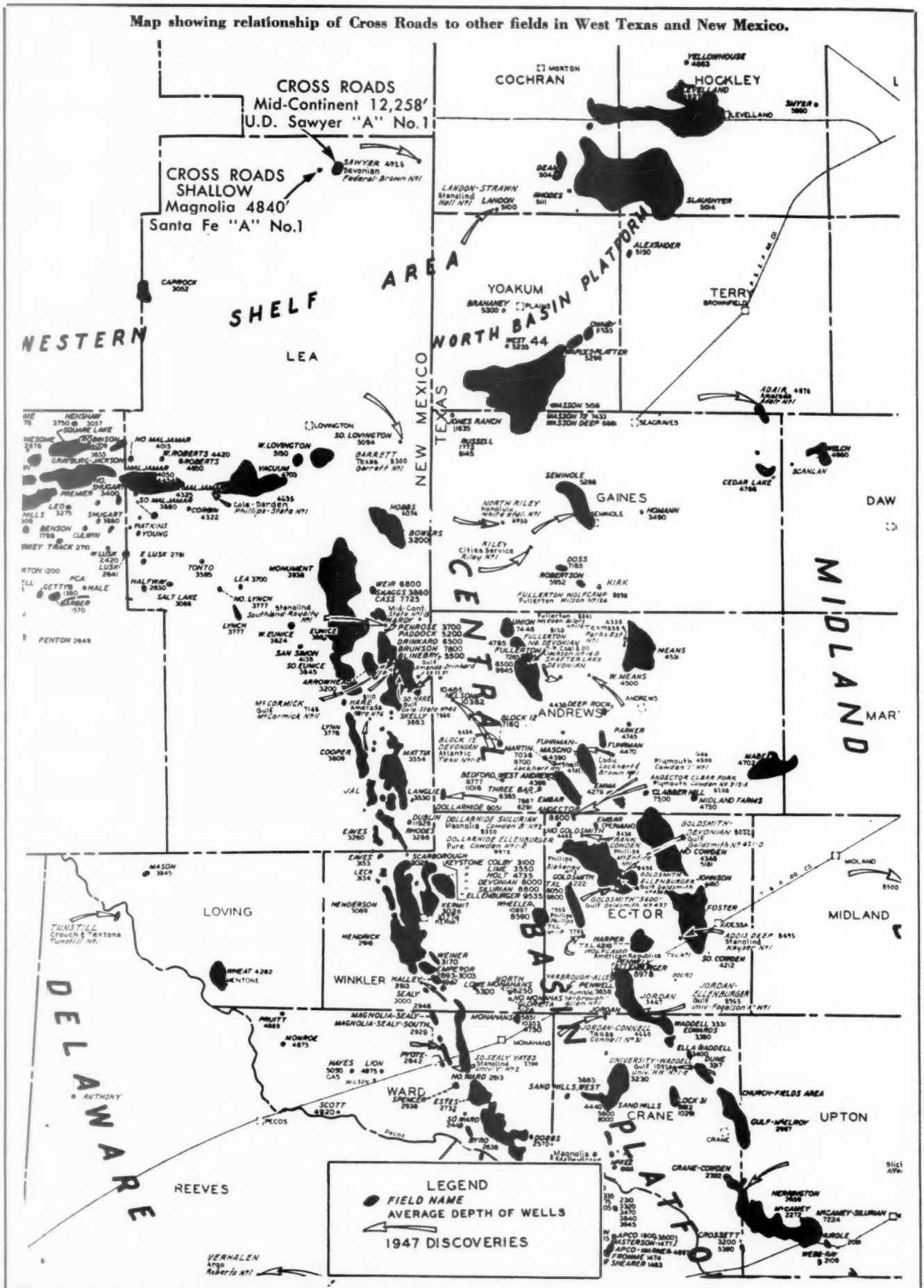
Under New Mexico regulations and because of a lack of tank room, the well had to be closed in until an allowable could be set. After a State hearing, the well was granted an allowable of 500 bbl per day. The production is now being transported by tank trucks from a battery of three 1000-bbl tanks to the Magnolia Petroleum Company's pipe line station at Eunice, New Mexico, which is about 100 miles south of the well.

The well was begun originally as a 5500-ft Permian test with a drilling rig rated nominally for 5000 ft. That rig was used to carry the well to about 8000 ft. Then a heavier rig was used to carry the well to 12.258 ft. The drilling was done for Mid-Continent by the McVay and Stafford Drilling Company of Tulsa, Oklahoma.

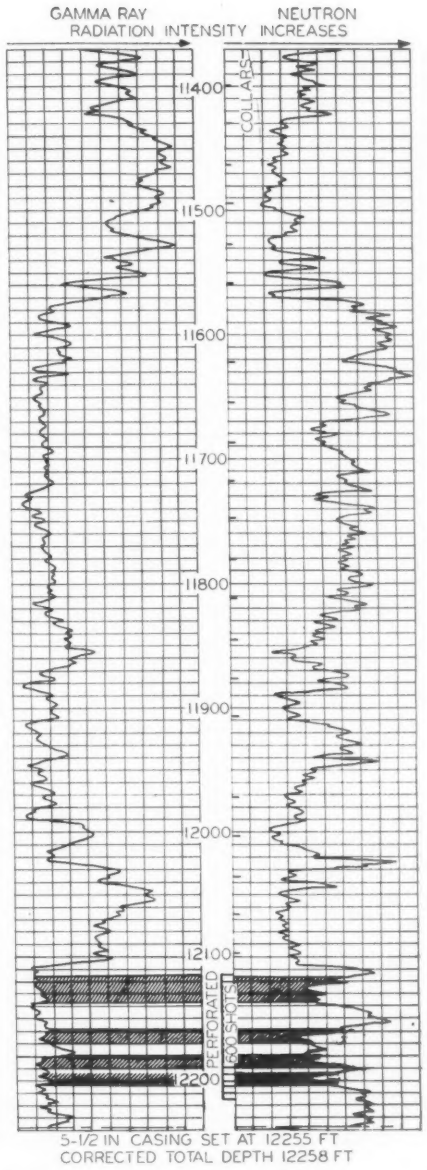
Although the producing formation has been referred to by some as being Ellenberger, it is believed by most geologists to be Devonian or Silurian. Unlike other areas in West Texas and New Mexico, only two mild chert sections were found, and the well was drilled to the total depth with relatively little difficulty.

Four locations were made for other deep tests in the area soon after the discovery well was completed. Magnolia Petroleum Company began its Santa Fe-Pacific "C" No. 1, one-half mile East of the discovery, in the SW of the SW of section 26- 9S-36E. It is now drilling be-

**Map showing relationship of Cross Roads to other fields in West Texas and New Mexico.**




*Map after C. D. Cantrell, Jr., Lloyd C. Mills, and Clyde W. Turner, AAPG Bulletin; Vol. 32, No. 6; June, 1948.*




**Radioactivity log of the discovery well of the Cross Roads field, Mid-Continent's U. D. Sawyer No. 1, showing indicated pay zones. The 5½ in. casing was perforated from 12,115 to 12,215 ft as indicated above with 600 shots.**

low 4200 ft. Mid-Continent Petroleum Company began its U. D. Sawyer "B" No. 1, about one-third mile southwest, in the NE of the NW of section 34 of the same township. It is now drilling below 4000 ft.

A northwest offset to the discovery well, Mid-Continent's Dessie Sawyer No. 1, in the NE of the SW of section 27, is now drilling below surface pipe. The fourth deep test in the area is a three-quarter mile southwest outpost in the NE of the NE of section 33, Skelly Oil Company's U. D. Sawyer No. 1.

As shown on the accompanying map, the discovery of deep production in the Crossroads area opens up a vast new area of exploratory drilling on the Northwest Shelf of the Permian basin of West Texas and New Mexico. Except for two small San Andres discoveries, Devonian's Brown No. 1 and Magnolia's Santa Fe "A" No. 1, Mid-Continent's discovery is about 25 miles west and north of the nearest field, the small Landon field in south Cochran County, Texas. The Caprock field is about 38 miles southwest of Crossroads, and the South Lovington field is about 44 miles south.

Although Mid-Continent's deep well is an unusually large producer with a very low gas-oil ratio (which indicates a good water drive), the probable extent of the new pool is very difficult to estimate. Some geologists think it may cover about 10 sections and others think it will be much smaller. Most of them agree, however, that many other similar wells and pools will be discovered in the Northwest Shelf area when more deep tests are drilled. It is also possible that the wells now drilling in the Crossroads discovery area will find more oil and gas production in deeper formations.

The discovery well was drilled and completed at a cost of about $300,000 in about 248 days, including 35 days for moving in and rigging up. It is estimated that $250,000 will be needed to drill and complete other wells in the Devonian producing zone, and that drilling and completing time can be reduced to a total of about 180 days. Heavier rigs are being used on the present drilling wells as shown in the accompanying pictures, and less time should be required for testing upper formations.

Salt water drilling mud with a starch base was used on the discovery well. Fresh water drilling mud could not be used due to an open salt section below the intermediate string. The mud used had a viscosity of 38 to 50, a weight of 9.8 to 10.5 lb per gal, a water loss of 6 to 14 cc, and a filter cake 2/32 to 3/32 in. in thickness. The water loss was reduced from 10 to 6 cc while coring the pay zone with a diamond bit.

The surface pipe, 13⅜ in. OD, 36 lb. was set at 264 ft and cemented with 300 sacks. The intermediate string of 9⅝ in., 36 lb casing was set at 3706 ft with 2800 sacks, and the producing string of 5½ in. OD, 20 lb casing was set at 12,255 ft with 700 sacks. The intermediate string of 9⅝ in. casing in future wells will be set at about 4500 ft, so as to case off the entire salt section.

The 5½ in. casing was perforated with 600 shots from 12,115 to 12,215 ft, as indicated on the accompanying radioactivity log. After treating the producing zone with 1000 gal of mud acid through the perforations, the well was swabbed down to about 2200 ft before it began

**FIG. 2. Mid-Continent's U. D. Sawyer "B" No. 1, located about 1500 ft southwest of the discovery well, was drilling below 2200 ft when this picture was made. The three drilling engines are operated by butane that is brought into the area by trucks. Saltwater drilling mud is being used until the intermediate string is set.**

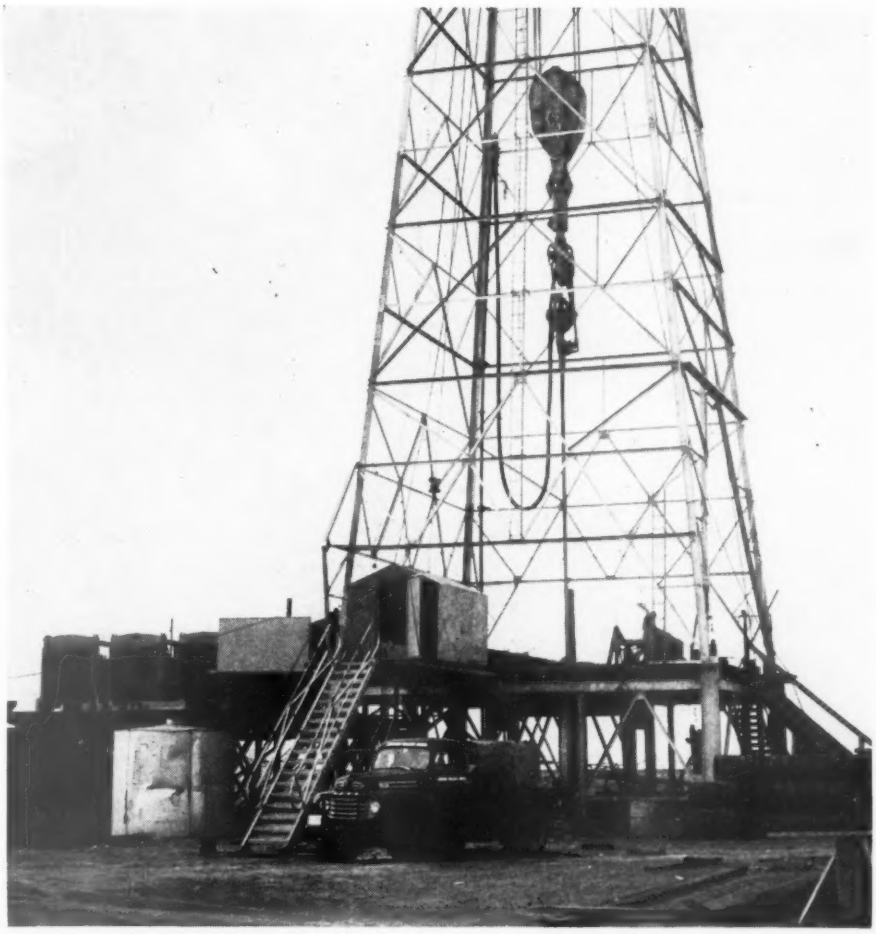
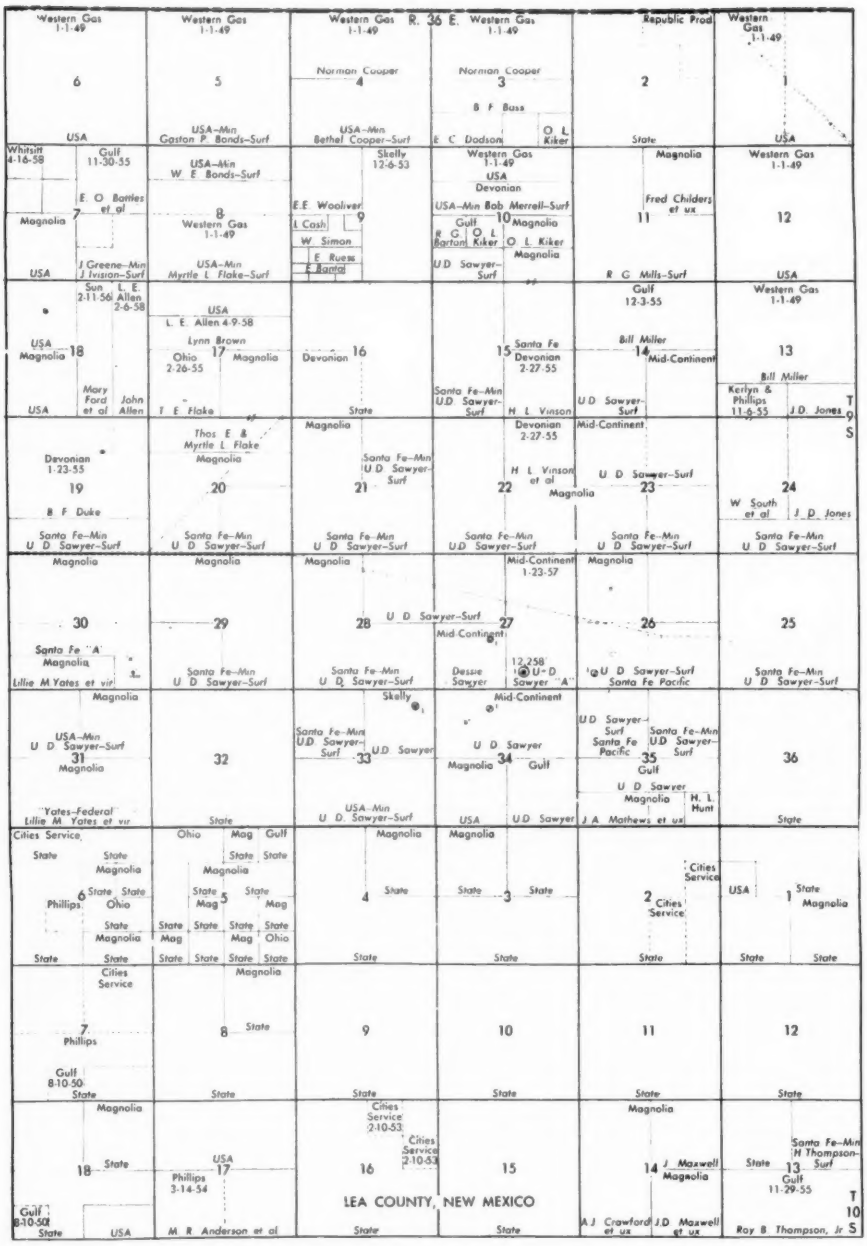


**TABLE 1. Drilling time record in producing zone.**

| Corrected Depth from | to | Time Min. |
|---|---|---|
| 12,105 | 12,110 | 355 |
| 12,110 | 12,115 | 264* |
| 12,115 | 12,120 | 190 |
| 120 | 125 | 190 |
| 125 | 130 | 115 |
| 130 | 135 | 130 |
| 135 | 140 | 294 |
| 140 | 145 | 178 |
| 145 | 150 | 155* |
| 150 | 155 | 177 |
| 155 | 160 | 105 |
| 160 | 165 | 72 |
| 165 | 170 | 52 |
| 170 | 175 | 56 |
| 175 | 180 | 52 |
| 180 | 185 | 85 |
| 185 | 190 | 115 |
| 190 | 195 | 62† |
| 195 | 12,200 | 60 |
| 12,200 | 12,205 | 32 |
| 205 | 210 | 34 |
| 210 | 215 | 52 |
| 215 | 220 | 55 |
| 220 | 225 | 78 |
| 225 | 230 | 75 |
| 230 | 235 | 56 |
| 235 | 240 | 48 |
| 240 | 245 | 60 |
| 245 | 250 | 65 |
| 250 | 255 | 80 |
| 255 | 258 | 44 |
| 12,258 | total depth | |

*Using new 7⅞-in. bit.
†Using diamond core bit.




**The Cross Roads field discovery well, Mid-Continent's U. D. Sawyer "A" No. 1 is in the SW of the SE of Section 27. Three offset wells and one outpost well are now drilling as indicated on this map. Magnolia's Santa Fe "A" No. 1 in the SE of Section 30 is a small pumping well in San Andres formation at total depth of 4840 ft.**

to flow. The flow was turned into the tanks after the well cleaned itself up for a while in a flow pit. It produced at an average rate of about 157 bbl per hr through a ¾ in. tubing choke during the first 6 hr and 20 min test, and it flowed at the rate of 170 bbl per hr during the last hour.

Table 1 shows the drilling time for 5-ft intervals through the producing formation. Drilling time in the section just above the pay varied from 40 to 60 min per ft using a 7⅞ in. rock bit with 11 4-in. drill collars on a string of 3½ in. drill pipe. Drilling time dropped from 51 to 38 min per ft as the drill cut into the pay section at 12,115 ft, and the average time in the upper 40 ft of the pay was about 36 min per ft. Drilling time dropped to about 16 min per ft in the next 35 ft.

Diamond coring was begun at 12,190 ft, and the coring time averaged about 6 to 7 min per ft in the softer sections of the pay zone. The average coring time for all of the 68-ft section cored was a little more than 11 min per ft. Table 3 gives a description of the cores recovered.

The anhydrite section of the well from 2200 to 2330 slowed the drilling rate down to about 15 min per ft. One 15 ft section took more than 22 min per ft. From the anhydrite section to the San Andres at 4110 ft, the drilling rate averaged about 7 min per ft, varying from 2 to 16 min.

The San Andres section was drilled at an average rate of about 16 min per ft, varying from 10 to more than 30 min in two or three places. The Glorieta section from 5455 to 6200 ft was drilled at an average rate of about 8 min per ft, varying from 4 to a little more than 20 min per ft in three or four places.

The Clear Fork section from 6200 to 7700 ft was drilled at a rate of about 14 min per ft, varying from 5 to as much as 36 min per ft. The Wichita (Abo) section from 7700 to 8960 ft was drilled at a rate of about 20 min per ft, varying from 10 to 55 min per ft.

The Wolfcamp section from 8960 to 9510 ft was drilled at a rate of about 30 min per ft, varying from 10 to 59 min per ft. The Cisco section from 9510 to 10,570 ft was drilled at a rate of about 25 min per ft, varying from 12 to 46 min per ft.

The Strawn section from 10,570 to 10,815 ft was drilled at a rate of about 40 min per ft, varying from 22 to 72 min per ft. The Bend section from 10,815 to 11,560 ft was drilled at a rate of about

**TABLE 2. Geological data, Mid-Continent's U. D. Sawyer "A" No. 1.**

| | Depth, ft | Subsea, ft |
|---|---|---|
| Elevation, derrick floor | | + 4,033 |
| Anhydrite, top | 2,220 | + 1,813 |
| Yates, top | 2,850 | + 1,183 |
| San Andres, top | 4,110 | — 77 |
| Glorieta, top | 5,455 | — 1,422 |
| Clear Fork, top | 6,200 | — 2,167 |
| Wichita (Abo), top | 7,700 | — 3,667 |
| Wolfcamp, top | 8,960 | — 4,927 |
| Cisco (Pennsylvanian), top | 9 510 | 5,477 |
| Strawn, top | 10,570 | — 6,537 |
| Bend, top | 10,815 | — 6,782 |
| Mississippian, top | 11,560 | — 7,527 |
| Devonian, top | 12,115 | — 8,082 |
| Total depth | 12,258 | — 8,225 |

**TABLE 3. Description of cores taken with diamond bit.**

| | |
|---|---|
| Core No. 1— | recovered 32 ft from 12,190 to 12,223 ft (corrected), light gray, medium crystalline dolomite with scattered intercrystalline porosity; light stain in pores; vugs scattered throughout core; all sizes of vugs, some more than 1-in. in diam; secondary crystals in vugs; stained; highly fractured horizontally and vertically; larger fractures have lots of secondary crystallization and black oil residue; some gas bubbled from fractures. |
| Core No. 2— | recovered 33 ft from 12,223 to 12,258 ft (corrected). |
| 12,223 to 12,225— | light gray, medium crystalline dolomite; black residue; dense with medium-fine vertical and horizontal fractures; small vug porosity with light stain. |
| 12,225 to 12,226— | medium stain and increased fracturing. |
| 12,226 to 12,228— | larger vugs. |
| 12,228 to 12,230— | slightly more dense; vugs with medium stain and more black residue; shows drilling mud and oil along broken fractures. |
| 12,230 to 12,235— | small increase in fracturing and vugs; light stain increasing. |
| 12,235 to 12,236— | good increase in horizontal fracturing and vug size up to 2 in. in diam; increased stain. |
| 12,236 to 12,239— | increase in fractures and vugs; good stain; residue. |
| 12,239 to 12,240— | more dense; less fracturing; much smaller vugs; light stain. |
| 12,240 to 12,242— | more fractures, but fine; lots of black residue; light stain. |
| 12,242 to 12,245— | slight increase in fracture size; lots of black residue; good stain. |
| 12,245 to 12,247— | fine fractures; somewhat denser; less staining. |
| 12,247 to 12,249— | slight increase in fracture size; stained. |
| 12,249 to 12,252— | dense with a few fine fractures; less residue. |
| 12,252 to 12,255— | less dense; larger fractures and vugs; a little residue; stained. |
| 12,255 to 12,256— | fine fractures; fairly dense; stained. |
| 12,256 to 12,258— | larger fractures; increased stain; some gas bubbles. |

**FIG. 3. Magnolia's Santa Fe-Pacific "C" No. 1, located about one-half mile east of the discovery well, was drilling below 2400 ft when this picture was made. Cylindrical butane tanks and a large water tank are seen on the left. One of two shallow water wells that supply water for the drilling operation is seen being pumped at the lower right by a small twin-crank pumping unit mounted on steel skids.**

46 min per ft, varying from 14 to 88 min per ft. The section from the top of the Mississippian at 11,560 to 12,115 ft was drilled at a rate of about 60 min per ft, varying from 30 min per ft in a few places to as much as 100 min per ft.

A total of 197 bits were used in drilling the discovery well. More than 60 of them were used in drilling the sections below 10,000 ft.

A total of five drill-stem tests were made between 4800 ft and 5957 ft. The only one that had any oil shows was the one from 4882 to 4950 ft. A sixth drill-stem test was made from 11,575 to 11,620 ft for 45 min without any shows. The other three drill-stem tests were made in the producing zone and are shown in Table 4.

The two diamond cores described in Table 3, were very much alike and very uniform. The dolomite varied throughout, and it was highly fractured, vugular, stained, and covered with gas bubbles. Scattered intercrystalline porosity was stained, and black oil residue was contained in the larger openings. The fractures in the core from 12,190 to 12,223 ft seemed to be better developed and more open than the fractures in the second core.

Until more data are obtained on the

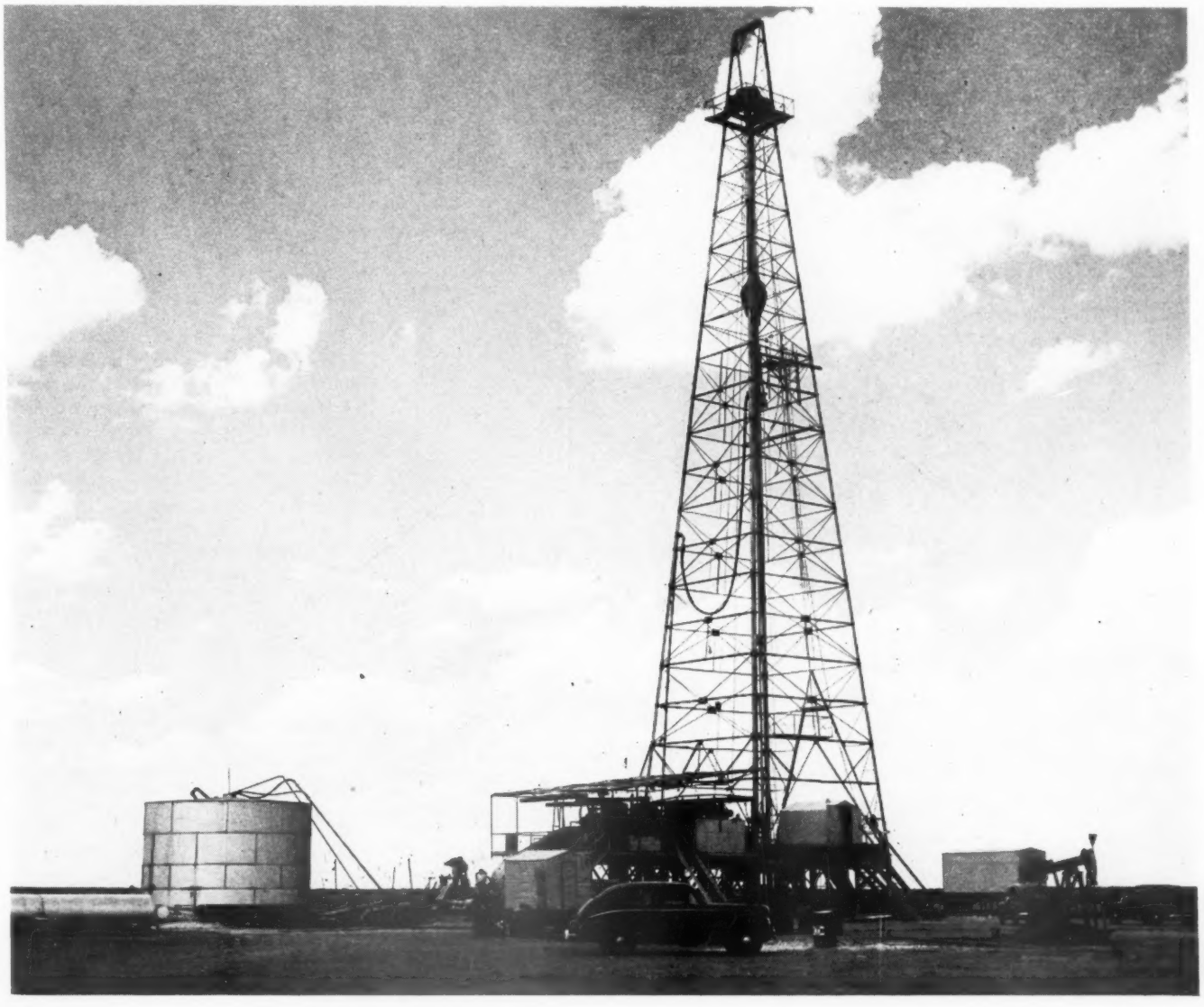


**TABLE 4. Results of drilling stem tests of producing zone in Mid-Continent's U. D. Sawyer "A" No. 1.**

| Dst. No. | Date | Corrected Depth, ft from | to | Time, hr. | Results (using 1-in. top and ⅝-in. bottom chokes)* |
|---|---|---|---|---|---|
| 7 | 4-16-48 | 12,108 | 12,190 | 3 | steady blow of air; no gas to surface; recovered 2880 ft of water blanket, 1080 ft of oil cut with water, 3150 ft of clean oil, 3660 ft of heavily oil cut mud, and 1260 ft of drilling water; 1722 psi flowing pressure, 3760 psi final flowing pressure, and 4920 psi 15-min closed-in pressure; 150-deg F bottomhole temperature; 6265 psi initial and final hydrostatic mud pressure. |
| 8 | 4-20-48 | 12,190 | 12,223 | 4 | good blow of air; water blanket reached surface in 3 hr, 15 min, and 1470 ft flowed out in 45 min; recovered 1530 ft of water blanket, 9931 ft of 42 deg API gravity oil, and 720 ft of drilling water; 1792 psi initial and 4686 psi final flowing pressure, and 5051 psi 15-min closed-in pressure; 6389 psi hydrostatic mud pressure. |
| 9 | 4-23-48 | 12,223 | 12,258 | 2 | light blow of air; stronger blow after tool opened again; recovered 2870 ft of water blanket, 130 ft oil cut with water, and 150 ft of clean oil; 1474 psi initial and 1520 psi final flowing pressure, and 4831 psi 15-min closed-in pressure; 150 deg F bottomhole temperature; 6685 psi initial and final hydrostatic mud pressure. |

*A 3000-ft water blanket was used on all three drill stem tests.

porosity, effective thickness, fluid content, and size of the new Crossroads Devonian oil reservoir, it is impossible to make more than a guess with regard to the ultimate crude oil recovery. The low gas-oil ratio indicates that oil production is due to a water drive, but the effectiveness of the drive will not be known until productivity index tests are made, or until the reservoir pressure begins to decline.

Although the town of Crossroads is little more than a combination grocery and postoffice on the blacktop highway from Tatum to Portales, New Mexico, a townsite is being surveyed. The discovery well is about six miles east of the town, and can be reached by a caliche-topped road. The well can also be reached over a similar road from Bledsoe, Texas, which is about 15 miles northeast of the new field. Bledsoe is a small town west of the Slaughter field area of Cochran County.

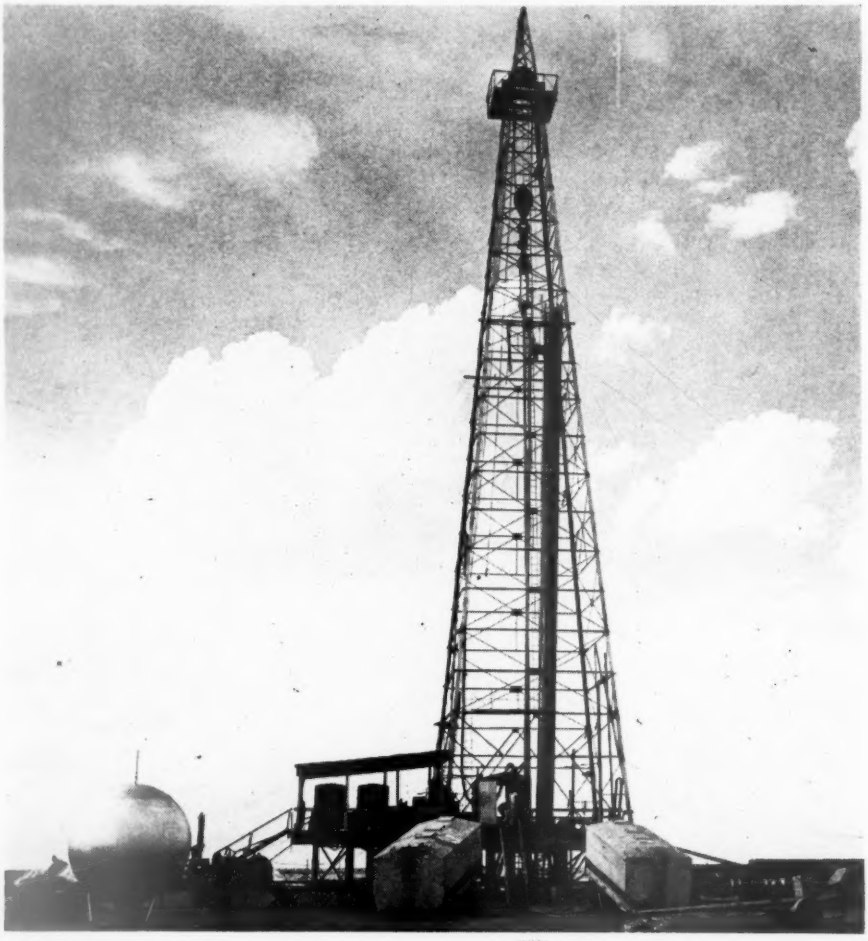


**FIG. 5. Preparations are being made to cement the intermediate casing string near 4500 ft in Skelly's southwest outpost well, U. D. Sawyer No. 1. Note the spherical butane tank and two bulk cement trailers. Cement is unloaded by a screw conveyor.**

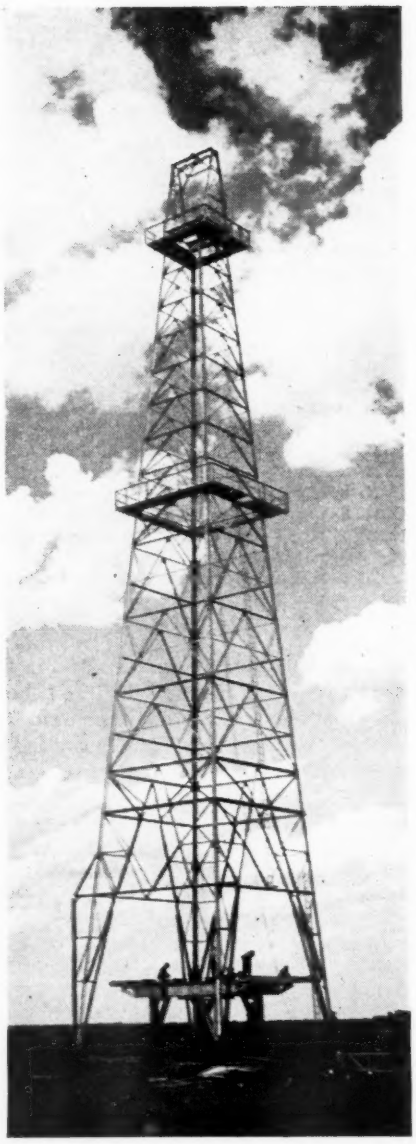


**FIG. 4. The derrick floor substructure is being erected for drilling Mid-Continent's Dessie Sawyer No. 1, the northwest offset to the discovery oil well.**

Power-type rigs are being used to drill the wells. Butane is now being used for fuel and an adequate quantity of fresh water is being obtained from shallow wells equipped with small pumping units.

The wells now being drilled are situated in the center of 40-acre tracts, but the official spacing rules for the new field have not been determined. At least one of the companies interested in the area is asking that not more than one well be drilled on each 80 acres. The decision of the New Mexico Commission will be known soon after the hearing that is now being held. It is possible that one well will be allowed on each 40 acres. The economics of production from this new deep reservoir will depend to a large extent upon the results obtained in the wells now being drilled, and how the wells perform. * * *

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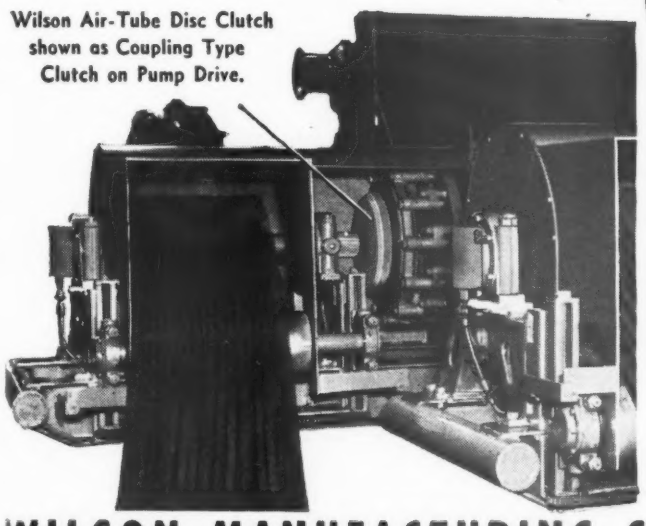

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# Hydrocarbon absorption and fractionation process design methods

## *Part 14. Minimum Plates and Reflux Limits of Design*

By WAYNE C. EDMISTER

EXCLUSIVE

As stated previously (Part 12, *The Petroleum Engineer*, April, 1948), there are: Short cut, empirical, graphical, and overall equation methods, as well as plate-to-plate methods of making multicomponent fractionation calculations. In the previous installment (Part 13, *The Petroleum Engineer*, June, 1948) three plate-to-plate procedures were discussed and examples solved. In Part 15 several alternate methods are presented and illustrated. It is impossible to cover all of the published works on this subject so representative procedures will be discussed.

In previous articles of this series plate-to-plate calculations were made for binary and multicomponent systems and it was noted that the principal difference was in meshing the enriching and stripping section calculations at the feed plate. The reason for this difference is the presence of the non-distributed components, both lighter and heavier than the key components. This difference between binary and multicomponent systems shows up even more importantly in some of the steps of the empirical methods, where the minimum reflux and minimum plates must be calculated.

In a binary fractionator the feed plate composition may be, and usually is, the same as the feed. In a multicomponent fractionator this is not the case. The liquid on the feed plate of a multicomponent fractionator will contain appreciable quantities of the components less volatile than the heavy key, while these heavier components do not appear in the enriching section above the feed in appreciable concentrations. Likewise, the feed plate liquid will contain appreciable amouts of the components more volatile than the light key, while these lighter components do not appear in the stripping section in appreciable concentrations. These concentration gradients were demonstrated by the plate-to-plate calculations in the previous installment.

In developing and applying calculation methods other than the rigorous plate-to-plate procedure to multicomponent fractionation, it is necessary to be very cautious about these concentration gradients. It is frequently worth while to estimate the limits of the operation, which are the minimum reflux with an infinite number of plates and the minimum plates with total reflux. These limits are of value in making a plate-to-plate solution, but they are particularly important to a short-cut method and a required step in empirical methods.

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### LIMITS OF DESIGN

The limits of any fractionator design, either binary or multicomponent, are: (a) minimum plates with total reflux, and (b) minimum reflux with infinite plates. These limits were demonstrated for binary distillation by XY plots in Fig. 42 (Part 10. *The Petroleum Engineer*, February, 1948). The minimum reflux and minimum plates limits cannot be as simply represented for multicomponent fractionation because of the multicomponent nature of the system, i.e., the presence of the non-distributed components that are more and less volatile than the key components. Where there are only two distributed components, which are the keys, the problem is more simple than when there are three or more distributed components.

The minimum number of equilibrium stages required for any separation is at total reflux with no product removed and consequently no addition of feed after the column has been charged. With total reflux (infinite reflux ratio) the L/V ratio is equal to unity throughout the column and the number of theoretical plates required is determined by the desired compositions at the top and bottom. This type of operation is of theoretical interest only because it is obviously impractical to have the minimum number of plates in a commercial column, thus establishing a limit for the design.

With no feed being added (at total reflux), there is no division of the column into enriching and stripping sections and, of course, no feed plate. The concentration gradients for all components are uniform from one end to the other with no sharp breaks.

The minimum reflux required for a given separation in a column of infinite plates is the other limit of a multicomponent fractionator design. This type of operation is also of theoretical interest and impractical commercially. Infinite plates are required at minimum reflux because pinch zones result, wherein the composition becomes constant and does not change from plate-to-plate regardless of the number of plates employed. Constant composition occurs in the enriching section, just above the feed plate, because the vapor boil-up is not sufficient to cause the necessary transfer of material.

For the distillation of a binary system, the pinch points or zones of constant composition occur at the feed plate for both enriching and stripping sections. In multicomponent fractionation this is not the case because of the presence of the non-distributed components, which cause the pinch zones to be on either side of the feed plate and a distance away from it. In an infinite plate column it is meaningless to reckon distance in number of plates. It is possible, however, to use temperature as the scale for locating pinch points, etc.

In visualizing minimum reflux operation, it is helpful to consider each product as containing all components of the feed even though the lightest and the heaviest components appear in extremely small concentrations in the bottoms and overhead, respectively. With terminal products thus defined, it is theoretically possible to start plate-to-plate calculations at each end of the fractionator and work toward the feed plate. At minimum reflux ratio operation, the zones of constant composition would be reached in each section where further calculations would gain nothing.

In the region between the feed plate and the enriching section pinch point, the concentration of the less volatile components would be reduced to a negligible amount so that the pinch point composition would consist of the key components and lighter.

Between the feed plate and the stripping section pinch point the concentration of the most volatile components would be reduced to a negligible amount so that the pinch point composition would consist of the key components and heavier.

Gilliland[7] divided a fractionating column operating at minimum reflux ratio into five imaginary regions, which are defined as follows, starting at the reboiler of the column:

a. *Reboiler to stripping section pinch*, wherein the only components present in significant amount are the keys and heavier and wherein the relative amount of the light key increases in amount in the vapor going up the column from the reboiler.

b. *Stripping section pinch zone*, wherein the concentrations of the keys and heavier are constant and an infi-

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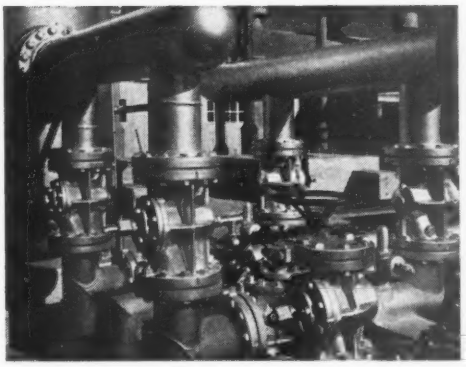
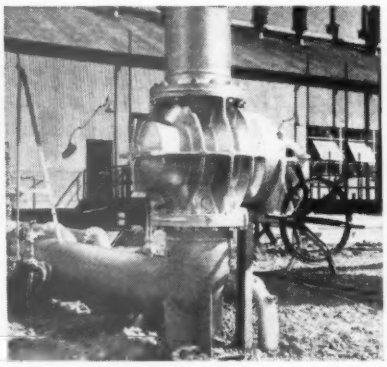
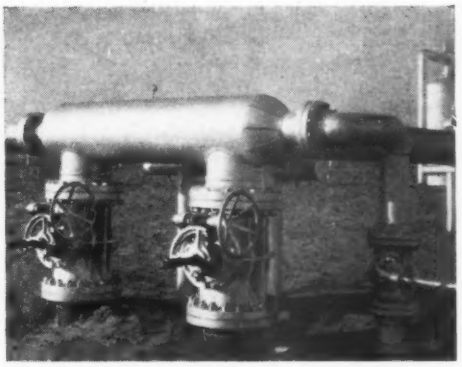


*Nordstrom valves on manifold in a compressor plant.*



*Nordstrom gear operated valve on incoming gas line from field.*



*Nordstrom valves on natural gas lines in field.*

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nite number of plates are required to make a finite change in composition.

c. *Intermediate region between pinch points,* which includes the feed plate; and wherein the components more volatile than the light key increases from negligible to significant amounts in going from stripping pinch to enriching section pinch, and wherein the components less volatile than the heavy key decreases from significant to negligible amounts.

d. *Enriching section pinch zone,* wherein the concentration of the keys and more volatile components are all constant and an infinite number of plates are required for a finite change in composition.

e. *Enriching section pinch to condenser,* wherein the only components present in significant amount are the keys and lighter and wherein the relative amount of the heavy key increased in amount in the liquid going down the column from the condenser.

Gilliland[7] points out that it is necessary to have pinch points in both enriching and stripping sections in order to satisfy the requirements for minimum reflux.

## MINIMUM PLATES AT TOTAL REFLUX

The minimum number of theoretical plates required for a given separation is one of the limits of the solution of a fractionation design problem. Such an operation is not realized in actual practice because it can only be accomplished by total reflux, with no products being removed from the column, which corresponds to an infinite reflux ratio. An experimental column could be operated with total reflux to obtain a limiting separation for a given number of plates. Calculation of the minimum number of equilibrium stages is relatively simple because $L = V$, $D = 0$ and $B = 0$.

In 1932 Fenske developed a relationship for the minimum plates at total reflux operation. Since then many authors have rederived or used this expression. Following is a condensed derivation of this simple and useful relationship:

Denoting two key components by single and double primes, (single for the light key and double for the heavy key), the equation for minimum plates for total reflux is derived as follows:

The equilibrium relationship given by the definition of K and

$$\frac{v'}{v''} = \frac{K'}{K''}\frac{l'}{l''} = \alpha\frac{l'}{l''} \quad . \quad . \quad . \quad (134)$$

Equation 134 applies at all points in the column.

At total reflux there is no distillate product, so $v_{i+1} = l_i$ for each component. Combining this relationship with equation 134 gives:

$$\frac{l'_i}{l''_i} = \frac{l'_{i+1}}{l''_{i+1}} \quad . \quad . \quad . \quad . \quad . \quad . \quad (135)$$

Equation 135 is a relationship betweent the moles of the two key components in the liquid leaving adjacent plates.

By combining the equilibrium relationship and the total reflux component material balance in the same fashion used to develop equation 135, but for successive plates to include the entire enriching section, an equation is obtained for the relative composition change for the key components. Using an average relative volatility for the entire section, this equation is:

$$\frac{d'}{d''} = (\alpha_{av})^n \frac{l'_n}{l''_n} \quad . \quad . \quad . \quad (136)$$

Equation 136 is for the enriching section. A similar equation is derived for the stripping section, which is:

$$\frac{l'_{m+1}}{l''_{m+1}} = (\alpha_{av})^m \frac{b'}{b''} \quad . \quad . \quad . \quad (137)$$

Combining equations 136 and 137 by noting that $l_n = l_{m+1}$, i.e. liquid leaving bottom plate in enriching section equal to liquid to the stripping section (this is true only at total reflux);

$$\frac{d'}{d''} = (\alpha_{av})^{n+m} \frac{b'}{b''} \quad . \quad . \quad . \quad (138)$$

Where:

$n+m$ = the total number of plates,
$\alpha_{av}$ = average relative volatility in entire column,
$d'/d''$ = ratio of key components in distillate,
$b'/b''$ = ratio of key components in bottoms.

As developed above, the n+m exponent in equation 138 is the total number of equilibrium steps required as infinite reflux ratio to go from one end of the column to the other, including the partial condenser and the reboiler.

Equation 138 is an approximation because of the use of an average value of the relative volatility. The minimum plates could be found by plate-to-plate calculations by making L=V. This is usually an unnecessary amount of work, however.

*Example 30.* As an illustration of the application of equation 138, the minimum number of equilibrium plates will be calculated for the separation used in the previous examples.

From the material balance given in Table 55 (Part 12, *The Petroleum Engineer,* April, 1948) the ratios of key components in the products is found as follows:

$$\frac{d'}{d''} = \frac{24.6}{0.3} = 82.0$$

$$\frac{b'}{b''} = \frac{0.4}{16.7} = 0.024$$

The average value of $\alpha = \frac{K'}{K''}$ is found from Fig. 52 (Part 12, *The Petroleum Engineer,* April, 1948) as follows:

| | *Top* | *Bottom* |
|---|---|---|
| $K'$ | 0.76 | 2.4 |
| $K''$ | 0.30 | 1.3 |
| $\alpha$ | 2.53 | 1.85 |
| $\alpha_{av}$ | 2.19 | |

Substituting in equation 138 gives:

$$(2.19)^{n+m} = \frac{82.0}{0.024} = 3420$$

$$n+m = 10.4$$

The minimum number of equilibrium stages required for this separation is found to be 10.4 as compared to 17 (9 stripping + 6 enriching + reboiler + partial condenser) for a finite reflux ratio of 1.5 to 1 as found by the plate-to-plate calculations.

## MINIMUM REFLUX AT INFINITE PLATES

The minimum reflux ratio required for a given separation is one of the limits of the solution of a fractionation design problem. Such an operation is not realizable in actual practice because it can only be accomplished with an infinite number of plates. Minimum reflux operation may be approached but not attained. Calculation of the minimum reflux is complex. Several methods, previously proposed, of calculating the minimum reflux will be discussed.

Equations for minimum reflux are developed from the fact that the difference in composition between any two adjacent plates decreases to a differential amount as the reflux ratio is decreased to the minimum value, below which the desired separation cannot be obtained even with an infinite number of plates.

For the minimum reflux ratio equations, it is more convenient to work with mole fractions and total quantities rather than component mole quantities.

For the enriching section pinch zone, where all components except those less volatile than the heavy key appear and where the concentration is constant from one plate to the next, the following component material balances are written for the two keys:

$$Vy'_n = Lx'_n + Dy'_d$$
$$Vy''_n = Lx''_n + Dy''_d$$

Dividing one of these equations by the other:

$$\frac{y'_n}{y''_n} = \frac{Lx'_n + Dy'_d}{Lx''_n + Dy''_d}$$

Replacing $y'_n/y''_n$ by its equivalent $\alpha\frac{x'_n}{x''_n}$, where $\alpha = \frac{K'}{K''}$, and rearranging gives:

$$\left(\frac{L}{D}\right)_{min.} = R_m = \frac{1}{\alpha - 1}\left(\frac{y'_d}{x'_n} - \alpha\frac{y''_d}{x''_n}\right) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (139)$$

Where:

$R_m$ = minimum reflux ratio,
$y'_d$ and $y''_d$ = mole fractions of light and heavy keys in the distillate,
$x'_n$ and $x''_n$ = mole fractions of light and heavy keys at the upper pinch point,
$\alpha$ = average relative volatility = $K'/K''$.

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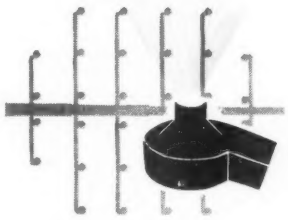

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This equation applies to all of the components that appear at the enriching pinch, i.e. all except those less volatile than the heavy key.

Solving for $x_n$, the concentration of the light components at the enriching section pinch point:

$$x_n = \frac{y_d}{(\alpha-1)(L/D)_{min.}+\alpha y_d''/x_n''} \quad \ldots\ldots\ldots\ldots (140)$$

The ratio $y_d''/x''_n$ is usually negligible because the concentration of the heavy key in the distillate is small.

Equation 140 gives the relationship between the concentration of any light component in the distillate and at the upper pinch point for minimum reflux ratio, for which calculation $\alpha$ is the relative volatility of the light component in question referred to the heavy key. Since the $\Sigma x_n = 1$, the value of $x_n$ for the heavy key is found by difference after finding $x_n$ for the lighter component by equation 140.

For the stripping section pinch zone, where all components except those more volatile than the light key appear and where the concentration is constant from one plate to the next, the following component material balances are written for the two keys:

$$Vy_m' = Lx_m' - Bx_b'$$
$$Vy_m'' = Lx_m'' - Bx_b''$$

Dividing one of these equations by the other:

$$\frac{y_m'}{y_m''} = \frac{Lx_m' - Bx_b'}{Lx_m'' - Bx_b''}$$

Replace $y'_m/y''_m$ by its equivalent $\frac{\alpha'}{\alpha''}\frac{x'_m}{x''_m}$ where $\alpha$ is the relative volatility.

In this equation it is necessary to use two $\alpha$ values or change the reference compound from the heavy key to the light key. The equation now being developed applies to the light key and all heavier components, whereas equation 140 applied to the heavy key and lighter. In finding pinch point compositions one component must be found by difference. In the case of the enriching pinch the heavy key was found by difference. At the stripping pinch the light key will be found by difference. For the component being found by difference, the relative volatility appears as a constant. In equation 140 the relative volatility of the heavy key was 1.0 because it was the reference component and hence, a constant $\alpha$ value appears as unity. In the present equation the relative volatility of the light key must appear as a constant $\alpha'$.

Substituting and rearranging gives:

$$\left(\frac{L}{B}\right)_{min} = \frac{1}{\alpha'-\alpha}\left[\alpha'\frac{x''_b}{x''_m} - \alpha\frac{x'_b}{x'_m}\right] \quad \ldots\ldots\ldots\ldots (141)$$

Where:

$\alpha'$ = volatility of light key relative to heavy key and is, therefore, constant for any computation.

$\alpha$ = volatility of heavy components relative to heavy key.

Solving for $x_m$, the concentration of the heavy components at the stripping section pinch point:

$$x_m = \frac{\alpha x_b}{(\alpha'-\alpha)(L/B)_{min}+\alpha x'_b/x'_m} \quad \ldots\ldots\ldots\ldots (142)$$

The ratio $x'_b/x'_m$ is usually negligible because the concentration of the light key in the bottoms is small.

Equation 142 gives the relationship between the concentration of any heavy component in the bottoms and the lower pinch point for minimum reflux ratio, for which calculation $\alpha$ is the relative volatility of the heavy component in question relative to the heavy key. Since $\Sigma x_m = 1$, the value of $x_m$ for the light key is found by difference after finding $x_m$ for the lighter components by equation 142.

If the compositions at the pinch points could be estimated accurately, the minimum reflux ratio could be found readily by equation 139 or 141. It might appear that these required compositions could be found by means of equations 140 and 142 for an assumed reflux ratio, but this cannot be done because there is no way to check the assumptions. For this reason empirical rules have been suggested to aid in calculating the minimum reflux ratio.

Fenske[10] suggested using the concentrations of the keys in the feed as those at the pinch point. This is correct only for a binary system where the pinch zones are adjacent to the feed plate.

*Example 31.* As an illustration of the application of equation 139 by Fenske's procedure, the minimum reflux ratio will be calculated for the separation used in the previous examples.

From the material balance given in Table 55 (Part 12) the following composition ratios are computed:

$$\frac{x'_d}{x'_f} = \frac{24.6/59.9}{25.0/100} = \frac{0.41}{0.25} = 1.64$$

$$\frac{x''_d}{x''_f} = \frac{0.3/59.9}{17.0/100} = \frac{0.005}{0.17} = 0.0294$$

From Fig 52 (Part 13) the average relative volatility of the key components in the enriching section is found to be:

$$\alpha_{av} = 2.20$$

Substituting in equation 139 gives the following minimum reflux ratio:

$$R_m = \frac{1}{2.20 - 1.0}$$

$$[1.64 - 2.20 \times 0.0294] = 1.31$$

This value of the minimum is to be compared with the 1.5 reflux ratio used in the various solutions of this separation in Parts 12 and 13. Equation 139 is very sensitive to the average value of the relative volatility, $\alpha_{av}$ used. For this particular calculation the value of $\alpha$ at the top of the column is 2.5 and at the feed plate the average is 2.0. At the reboiler $\alpha = 1.85$. The greater the value of $\alpha_{av}$, the lower the value of $R_m$.

Underwood's[14] equation for the minimum reflux ratio is in a different form. Following is Underwood's equation, slightly modified from the form given by Gilliland[7] in a recent paper on minimum reflux ratio, to be in consistent nomenclature:

$$\alpha\left[\frac{(1+R_m)Z'' - \left(1 - \frac{L_m - L_n}{F}\right)x'_d}{(1+R_m)Z' - \left(1 - \frac{L_m - L_n}{F}\right)x''_d}\right] = \left[\frac{R_m Z' + \frac{L_m - L_n}{F}x'_d}{R_m Z'' + \frac{L_m - L_n}{F}x''_d}\right] \quad (143)$$

Where:

$Z'$ and $Z''$ = mole fractions of light and heavy keys in the feed,

$F$ = moles of feed,

$L_m - L_n$ = difference in stripping section and enriching section reflux, equals $L_f$, the liquid portion of feed when feed is between bubble and dew points,

$\alpha$ = relative volatility.

Underwood's developments were for the case of constant relative volatility. Equation 140 is sensitive to the value of $\alpha$ used. It appears that the average $\alpha$ for the enriching section should be used.

*Example 32.* As an illustration of the application of equation 143, the minimum reflux ratio for the problem of the previous example will be calculated for two values of $\alpha$, namely the average of 2.2 and the top value of 2.5.

$$\alpha = \frac{(1+R_m)0.25 - (0.66)0.41}{(1+R_m)0.17 - (0.66)0.005}$$

$$\frac{R_m 0.25 + (0.34)0.41}{R_m 0.17 + (0.34)0.005}$$

This equation is most conveniently solved by trial.

| *Assumed* | *Left side* | | |
|---|---|---|---|
| $R_m$ | $\alpha = 2.2$ | $\alpha = 2.5$ | *Right side* |
| 1.40 | 1.78 | 2.02 | 2.04 |
| 1.50 | 1.84 | 2.09 | 2.00 |
| 1.60 | 1.90 | 2.16 | 1.97 |
| 1.70 | 1.96 | 2.22 | 1.94 |

With an $\alpha$ value of 2.2 the minimum reflux ratio from equation 143 is about 1.7. With an $\alpha$ value of 2.5 the minimum reflux ratio is about 1.4. Both of these $R_m$ results are greater than the result found by equation 139 and obviously not correct because a reflux ratio of 1.5 was used in plate-to-plate solutions in examples 27, 28 and 29 (Part 13), where a finite number of plates were found for this separation with the reflux ratio of 1.5.

Gilliland[7] found that Underwood's[14]

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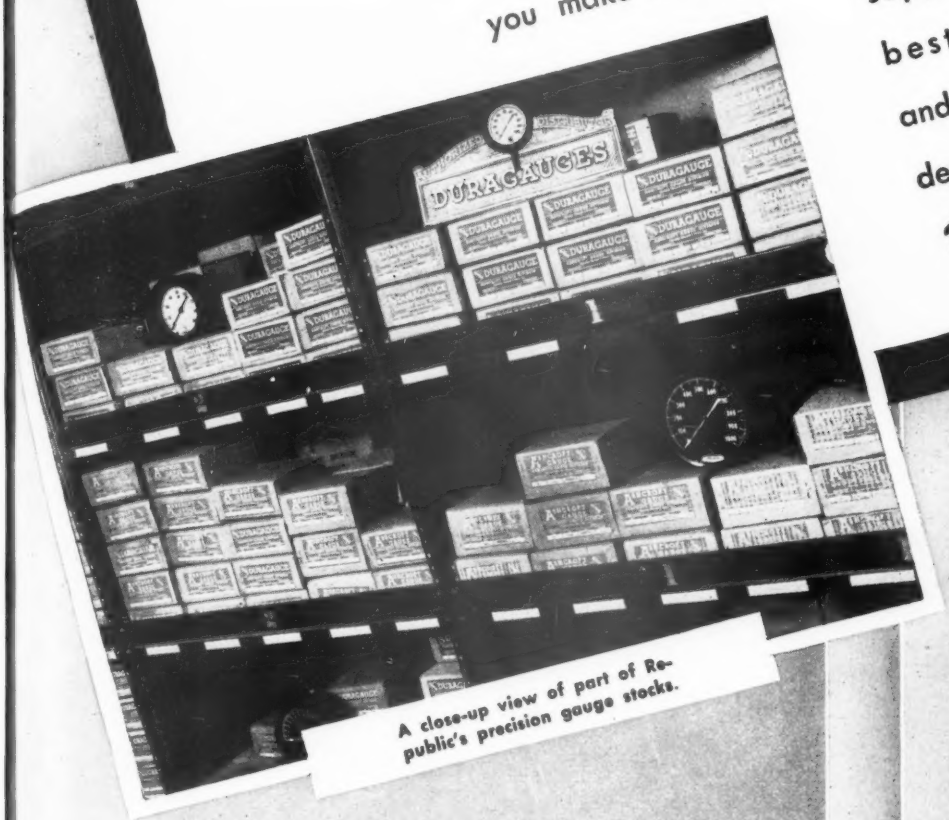


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equation (i.e. equation 143) for minimum reflux ratio gave results appreciably higher than the true minimum reflux ratios, as found by rigorous plate-to-plate calculations, and also higher than a method proposed.

Gilliland[7] brackets the minimum reflux ratio between two assumptions, which are:

(a) All components are present in significant amounts in both pinch zones.

(b) The ratio of the amounts of the key components is the same at both enriching and stripping pinch points.

Gilliland points out that the first assumption is not strictly correct because the less volatile non-distributed components do not appear at the upper pinch and the more volatile non-distributed components do not appear at the lower pinch. Thus, the first assumption gives a reflux ratio value equal to or greater than the true minimum. Gilliland also points out that the second assumption is not strictly correct either because the concentrations may change from one pinch point to the other in the opposite direction to that desired for the separation. Thus, the second assumption gives a reflux ratio value equal to or less than the true minimum reflux ratio.

From these concepts Gilliland[7] developed alternate equations for calculating the upper and lower limits for the minimum reflux ratio. These four equations, two for the lower limit and two for the upper limit, are complex to the point where their practicality might be questioned. Because of the complexity and the lack of space, Gilliland's minimum reflux equations will not be summarized or illustrated here. The reader is referred to the original article.

Colburn[1] points out that the sure way of finding the minimum reflux ratio is to make plate-to-plate calculations between the two pinch points, but that this procedure is too laborious for routine calculations, although it can be used to test empirical and short cut methods.

Colburn proposes such a short cut empirical method, which uses the following relationship:

$$\frac{r_m}{r_n} = \psi = \frac{1}{(1-\Sigma C_m \alpha x_m)(1-\Sigma C_n x_n)} \quad \ldots\ldots\ldots\ldots (144)$$

Equation 144, which is empirical, is applied with equations 140 and 142, or their equivalent in terms of K rather than $\alpha$. This method was developed by a study of a large number of correct solutions for the minimum reflux ratio. The $C_m$ and $C_n$ terms for the non-distributed components are empirical factors given by graphs developed by Colburn. This method will be discussed with the Brown-Martin empirical method for making multicomponent fractionation designs. See Table 71 (in Part 15, the next installment) for a summary of this method, including Colburn's minimum reflux procedure.

Colburn's procedure is to assume a value of the minimum reflux ratio, thus fixing $r_m/r_n$ to be checked by equation 144, and then find by equations 140 and 142 the pinch compositions. With these compositions, $r_m/r_n$ is found by equation 144, using the graphs for finding $C_m$ and $C_n$. At the correct minimum reflux ratio the two values of $r_m/r_n$, i.e. one found from assumed minimum reflux and one from equation 144, are the same.

By neglecting one term in a rigorous equation, Colburn obtained the following equation for approximating $x'_n$ for the light key to be used in finding a first-trial minimum reflux ratio:

$$x'_n \text{ (approx.)} = \frac{x'_f/x''_f}{(1+x'_f/x''_f)(1+\Sigma \alpha x_f)} \quad \ldots\ldots\ldots\ldots (145)$$

Where:

$x'_f/x''_f$ = estimated ratio of the key components on the feed plate. This ratio is estimated by finding the ratio in the liquid portion of the feed.

$x_f$ = mole fraction of all components in the liquid portion of the feed heavier than the heavy key.

$\alpha$ = relative volatility at feed flashing condition.

The value of $x'_n$ from equation 145 is then used in equation 139, with the last term neglected, to find a "first-trial" minimum reflux ratio.

*Example 33.* As an illustration of Colburn's method of finding the minimum ratio, the problem used in the previous examples will be solved. This example happens to be the same one Colburn used, so the following repeats his previous solution.

For this example the pinch temperatures found by Colburn will be used although it is possible to assume temperatures and check via boiling point calculations.

| Location | Upper pinch | Feed flash | Lower pinch |
|---|---|---|---|
| Temp. °F | 145 | 175 | 235 |
| Relative Volatility | | | |
| $C_1$ | 24.2 | 20.6 | 17.4 |
| $C_2$ | 5.57 | 5.08 | 4.65 |
| $C_3$ | 2.20 | 2.06 | 1.89 |
| $C_4$ | 1.0 | 1.0 | 1.0 |
| $C_5$ | 0.414 | 0.429 | 0.495 |
| $C_6$ | 0.172 | 0.206 | 0.264 |

All of these relative volatilities are not required, they are but included to show that average $\alpha$ values cannot be used.

The compositions required for the solution are calculated from the data given in Table 55 and listed at the top of the next column:

| | $y_d$ | $x_b$ | $x_f$ |
|---|---|---|---|
| $C_1$ | 0.434 | — | 0.029 |
| $C_2$ | 0.150 | — | 0.029 |
| $C_3$ | 0.411 | 0.010 | 0.206 |
| $C_4$ | 0.005 | 0.417 | 0.235 |
| $C_5$ | — | 0.274 | 0.206 |
| $C_6$ | — | 0.299 | 0.295 |
| | 1.000 | 1.000 | 1.000 |

These are the same values used by Colburn.

Propane is the light key and butane is the heavy key. Using the values of $x_f$ and $\alpha$ from above tabulations the $\Sigma \alpha x_f$ term is found: $\Sigma \alpha x_f = 0.429 (0.206) + 0.206(0.295) = 0.144$.

Substituting into equation 145:

$$x'_n \text{ (approx.)} = \frac{0.206/0.235}{\left(1+\frac{0.206}{0.235}\right)(1+0.149)} = 0.407$$

With this value of $x'_n$, an approximate value of the minimum reflux ratio is found by substituting in equation 139, neglecting the last term, as follows:

$$R_m = \frac{1}{2.06 - 1.0}\left(\frac{0.411}{0.407}\right) = 0.95$$

In his calculations Colburn found that 0.96 was the correct value of the minimum reflux ratio. Accordingly, a value of 0.96 will be used to complete the calculation. For this value of $\frac{L_n}{D}$ the $\frac{L_m}{B}$ ratio found as follows:

$$L_n = 0.96 \times 59.9 = 57.5$$
$$L_m = 57.5 + 34.0 = 91.5$$
$$L_m/B = 91.5/40.1 = 2.28$$

The next step is to find $x_n$ values from equation 140 and from these find $C_n$ and $r_n$. For this the $\alpha$ values at 145 °F are used. Values of $x''_n$ are required in solving equation 140 and yet $x''_n$ must be found by difference after the other values of $x_n$ are found. This involves trial-and-error calculations. For the first trial a value of $x''_n = 0.6$ will be used, which gives:

$$y''_d/x''_n = \frac{0.005}{0.600} = 0.0083$$

Substituting in equation 140 for a temperature of 145 °F gives $x_n$. Then the correction factors $C_n$ are found.

| | $0.96(\alpha-1)$ | $0.0083\alpha$ | $x_n$ Eq 140 | $\frac{(\alpha_L-1)\alpha_L}{\alpha}$ | $C_n$ Table 71 | $C_n x_n$ |
|---|---|---|---|---|---|---|
| $C_1$ | 22.3 | 0.201 | 0.0192 | 0.109 | 0.35 | 0.0067 |
| $C_2$ | 4.39 | 0.0463 | 0.0338 | 0.474 | 0.95 | 0.0322 |
| $C_3$ | 1.15 | 0.0183 | 0.3520 | .. | .. | .. |
| $C_4$ | .. | .. | 0.5950* | .. | .. | .. |
| | | | 1.00 | | | 0.0389 |

*By diff. and checks assume 0.600.

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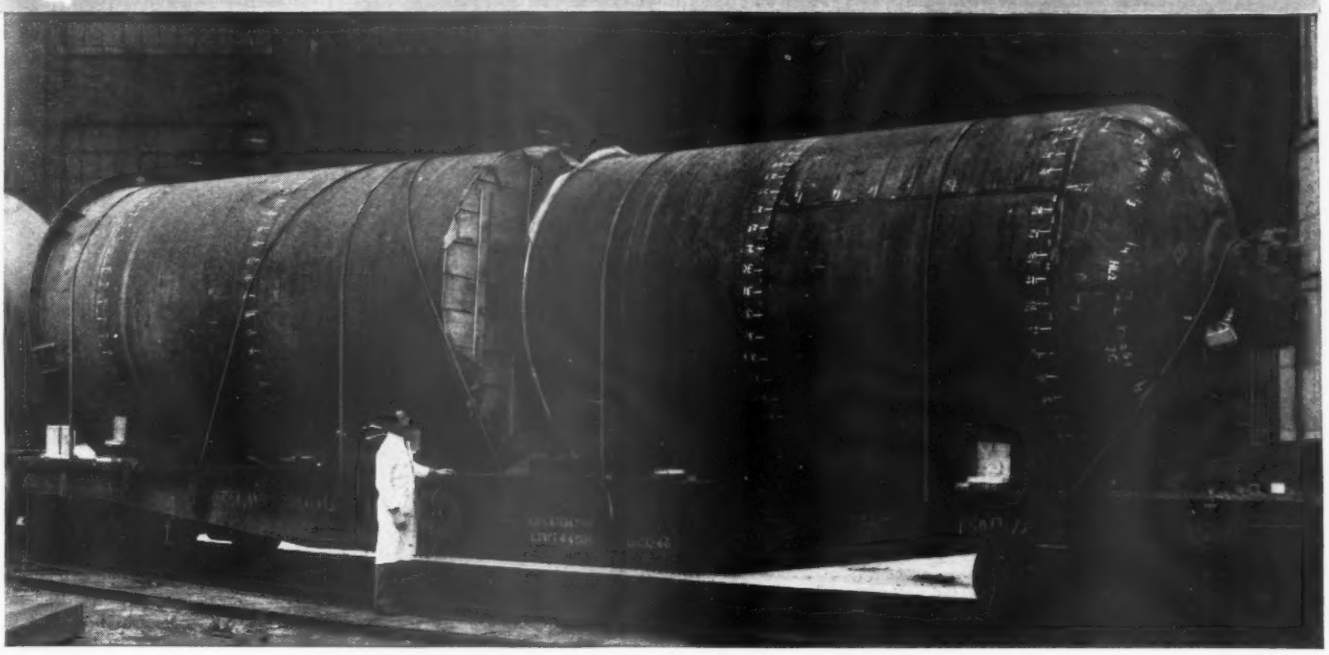

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From the above calculations, the following are found for later use:

$r_n = 0.352/0.595 = 0.592$

$\Sigma C_n x_n = 0.0389$

The next step is to make the same calculation for the stripping section pinch point, using equation 142. Here likewise one of the answers of the calculations is required in making the calculations. This is $x'_m$, which will be assumed as 0.300 so the calculations may proceed after finding:

$$x'_b/x'_m = \frac{0.010}{0.300} = 0.0333$$

Substituting in equation 142 gives $x_m$. Then the correction factors are found. The lower pinch temperature is 235 °F, at which $\alpha' = 1.89$.

| | 2.28 (1.89—$\alpha$) | 0.0333$\alpha$ | 1.89 $X_b$ | $x_m$ Eq 142 | $(\alpha_L-1)\alpha$ | C $_{cm}$ Table 71 | C $_{cm}\alpha x_m$ |
|---|---|---|---|---|---|---|---|
| $C_3$ | .. | .. | .. | 0.295* | .. | .. | .. |
| $C_4$ | 2.00 | 0.0333 | 0.786 | 0.386 | .. | .. | .. |
| $C_5$ | 3.08 | 0.0165 | 0.515 | 0.166 | 0.44 | 1.00 | 0.082 |
| $C_6$ | 3.68 | 0.0088 | 0.562 | 0.153 | 0.235 | 0.90 | 0.036 |
| | | | | 1.000 | | | 0.118 |

*By diff. and checks assumed 0.300.

From the above calculations, the following are found for later use:

$$r_m = \frac{0.295}{0.386} = 0.763$$

$$\Sigma C_m \alpha x_m = 0.118$$

With the compositions and other values at each pinch point, it is possible to complete the computation to check the assumed minimum reflux ratio of 0.95.

$$\frac{r_m}{r_n} = \frac{0.763}{0.592} = 1.28$$

By equation 144:

$$\frac{r_m}{r_n} = \frac{1}{(1-0.118)(1-0.059)} = 1.18$$

The difference in the two $r_m/r_n$ values indicates that the assumed minimum reflux ratio of 0.96 is slightly high.

As Colburn points out the value of $r_m/r_n$ found directly from the pinch compositions is very sensitive to the assumed value of minimum reflux ratio. Also it is very sensitive to the $\alpha$ values used. In the calculations presented for this example in this series of articles slightly different values of the equilibrium constants are used which reflects in the results. This does not detract from the value of the examples as illustrations of the methods, however.

By the Colburn method a minimum reflux ratio of 0.95 to 0.96 was obtained. This is to be compared with the value of 1.31 found in example 31 where equation 139 was applied with feed compositions rather than with pinch point composition. From this large difference it is apparent that the lighter and heavier non-distributed components have an appreciable effect on the minimum reflux ratio.

Jenny[10] determines the minimum reflux ratio by making trial calculations to find the amounts of the heavy key in the vapor to the enriching section and of the light key in the liquid to the stripping section. These calculations are made at an assumed minimum reflux ratio, the assumption being checked by material balance, i.e. the amount of heavy key found in the vapor to enriching section by this calculation at minimum reflux must equal the amount that appears in the distillate. The same criterion is applied to the light key at the stripping section pinch.

In making these calculations, Jenny uses the constant composition temperatures found by the type of calculation given in Table 57 (Part 12). Jenny's procedure for finding the minimum reflux fits in well with his graphical method for multicomponent fractionation design, which will be discussed in the next chapter. It also fits in well with this author's multicomponent design method which will be presented in a later installment. Colburn's empirical method is more convenient for use with the empirical method of multicomponent design proposed by Brown and Martin, which will be discussed later in this installment.

Scheibel and Montross[12] suggested an interesting method of finding the minimum reflux. A pseudo minimum reflux ratio is calculated for the key components as a binary system, i.e. assuming zero volatility for the heavier components and infinite volatility for the lighter components. Then the additional or incremental reflux quantities required to separate these non-distributed components from their opposite keys (i.e. heavier from light key and lighter from heavy key ) are found by empirical functions developed from an analysis of a number of systems. The Scheibel and Montross equations for the minimum reflux ratio look complex but are really simple to apply. Four equations are required, one to give the pseudo minimum reflux ratio, two to evaluate intermediate terms required, and one equation to find the corrected minimum reflux ratio from the pseudo ratio and other information about the system. The final equation for the corrected minimum reflux is:

$$R_m = \frac{\left[Z'R'_m + (\Sigma X_H)\Sigma \frac{Z''_H}{\alpha_K/\alpha''_H - 1} + \Sigma \frac{Z'_L}{\alpha'_L}\left(1 + \frac{\alpha_K}{\alpha'_L}\right)\right]}{\Sigma Z_L} \quad . \quad . \quad . \quad . \quad (146)$$

Where:

$Z'$ = mole fraction of light key in total feed,

$\Sigma Z_L$ = summation of mole fractions of the light key and lighter components in the feed,

$Z''$ = mole fraction of the heavy key in the feed,

$\Sigma Z_H$ = summation of mole fractions of the heavy key and heavier components in the feed,

$\alpha_K$ = relative volatility at the feed plate of the key components, i.e. K′/K″ or ratio of equilibrium constant for the light key divided by the equilibrium constant for the heavy key,

$\alpha'_L$ = relative volatilities at the feed plate of the components lighter than the light key, referred to the heavy key,

$\alpha''_H$ = relative volatilities at the feed plate of the components heavier than the heavy key, referred to the heavy key,

$R'_m$ = pseudo minimum reflux ratio, obtained from the next equation.

Note: It has been necessary to change the designation for $\alpha$ from that used with Colburn's method. The reader should be careful about nomenclature in this instance and others. Attempts have been made to change nomenclature to a consistent system throughout, but some items were overlooked. Time has not permitted going back and revising where necessary to have a completely satisfactory system of notation.

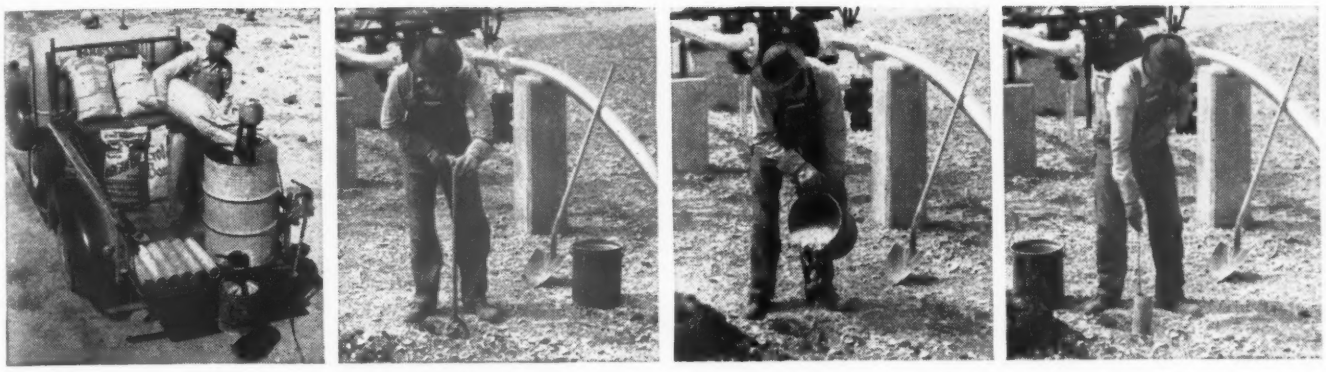
Following is Scheibel and Montross equation for the pseudo minimum reflux ratio:

$$R'_m = \frac{x'_p}{(\alpha_K - 1)x'_i} - \frac{(1-x'_p)\ \alpha_K}{(1-x'_i)(\alpha_K - 1)} \quad . \quad . \quad (147)$$

Where:

$x'_p = \frac{d'}{d'+d''}$ = mole fraction of light key in distillate based on key components only,

$x'_i$ = liquid composition of feed line intersection with equilibrium curve, expressed for light key and based on keys only. This term is found by the next equation.



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When the distillate contains a small amount of heavy key, the last term in equation is zero.

The intersection of the feed and equilibrium lines on an xy diagram for the binary of the keys, neglecting the lighter and heavier non-volatile components, is given by the following equation which is found by combining the equation for the equilibrium line with the equation from the line for the feed composition and phase condition. This equation is:

$$x'_i = \frac{(\alpha_K - 1)(1+q)\left(\frac{Z'}{Z'+Z''}\right) - \alpha_K - q \pm \sqrt{\left[(\alpha_K - 1)(1+q)\left(\frac{Z'}{Z'+Z''}\right) - \alpha_K - q\right]^2 + 4q(\alpha_K - 1)(1+q)\left(\frac{Z'}{Z'+Z''}\right)}}{2q(\alpha_K - 1)} \quad (148)$$

Where all terms except q have been defined as a pseudo-ratio of liquid to vapor and this new term is given by the following equation:

$$q = \frac{L_f - \Sigma F''_H}{V_f - \Sigma F'_L} \quad . \quad . \quad . \quad . \quad (149)$$

Where:

$L_f$ = moles of liquid feed,

$V_f$ = moles of vapor feed,

$\Sigma F''_H$ = total moles of components heavier than heavy key in feed,

$\Sigma F'_L$ = total moles of components lighter than light key in feed.

These equations are all empirical and yet the method has the advantage of being straight forward with no trial-and error steps with assumptions and guesses. Also there are arbitrary constants to obtain from graphs.

*Example 34.* As an illustration of this minimum reflux ratio calculation method for the above problem will be solved by the above equations, obtaining the necessary data from Tables 55 and 57. Substituting in equation 149:

$$q = \frac{34-23}{66-35} = 0.354$$

Substituting in equation 148:

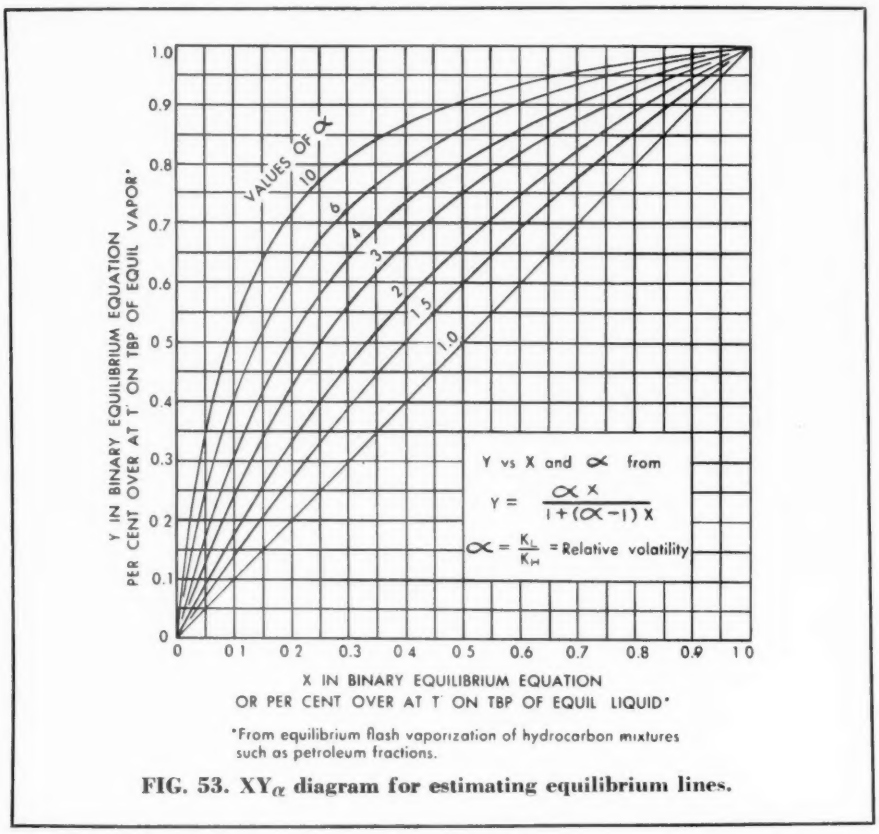

Y IN BINARY EQUILIBRIUM EQUATION
PER CENT OVER AT T ON TBP OF EQUIL VAPOR*
X IN BINARY EQUILIBRIUM EQUATION
OR PER CENT OVER AT T ON TBP OF EQUIL LIQUID*
VALUES OF α
10
6
4
3
2
1.5
1.0
Y vs X and α from
Y = αX / 1+(α−1)X
α = K_L/K_H = Relative volatility
*From equilibrium flash vaporization of hydrocarbon mixtures such as petroleum fractions.

**FIG. 53. XY$_\alpha$ diagram for estimating equilibrium lines.**

$$(\alpha_K - 1)(1+q)\left(\frac{Z'}{Z'+Z''}\right) = (2.06-1.0)(1.354)\left(\frac{25}{42}\right) = 0.855$$

$$x'_i = \frac{0.855 - 2.06 - 0.354 \pm \sqrt{(0.855-2.06-0.354)^2 + 4(0.354)(0.855)}}{2(0.354)(2.06-1.0)}$$

$$x'_i = 0.465$$

This agrees with the value of 0.470 found from an xy diagram of the key component binary by Scheibel and Montross.

The value of $x'_p$ for solution of equation 146 is:

$$x'_p = \frac{24.6}{24.6+0.30} = 0.988$$

By equation 146 the pseudo minimum reflux ratio is:

$$R'_m = \frac{0.988}{(2.06-1.0)(0.465)} - \frac{(1.0-0.988)2.06}{(1.0-0.465)(2.06-1.0)} = 1.96$$

This value of $R'_m$ agrees with the value of 2.065 found from the xy diagram of the key component binary by Scheibel and Montross.

Substituting in equation 146 to obtain the corrected minimum reflux ratio. First find summation terms:

$$\Sigma \frac{Z''_H}{(\alpha_K/\alpha''_H - 1)} = \frac{0.11}{\frac{2.06}{0.43} - 1} + \frac{0.12}{\frac{2.06}{0.206} - 1} = 0.042$$

$$\Sigma \frac{Z'_L}{\alpha'_L}\left(1 + \frac{\alpha_K}{\alpha'_L}\right) = \frac{0.26}{20.6}\left(1+\frac{2.06}{20.6}\right) + \frac{0.09}{5.1}\left(1+\frac{2.06}{5.1}\right) = 0.0387$$

$$\Sigma Z_H = 0.17+0.11+0.12 = 0.40$$

$$\Sigma Z_L = 0.26+0.09+0.25 = 0.60$$

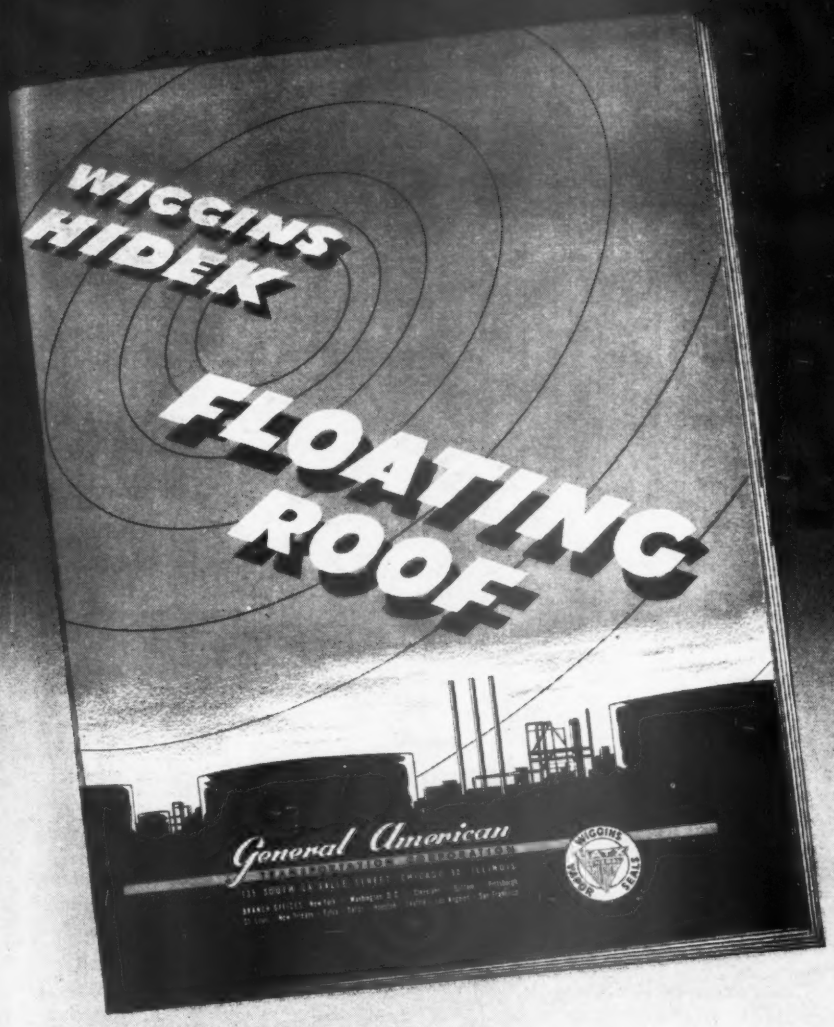
$$R_m = \frac{0.25(1.96)+0.40(0.042)+0.0387}{0.60},$$

giving

$$R_m = 0.91$$

This value of $R_m$ is lower than the 0.955 found by Scheibel and Montross because of the lower value of the pseudo minimum found by the above solution. A direct comparison of the calculations is not possible because Scheibel and Montross found $R'_m$ by the xy diagram rather than their own equations.

The difference could be due to the different values used in the above calculations. However, the results are very good and it can be concluded that this method is reliable and convenient. Recently Bailey and Coats[1] modified the Scheibel and Montross method and claim an improved procedure. Time and space do not permit discussing this more recent method or presenting an example of its application.

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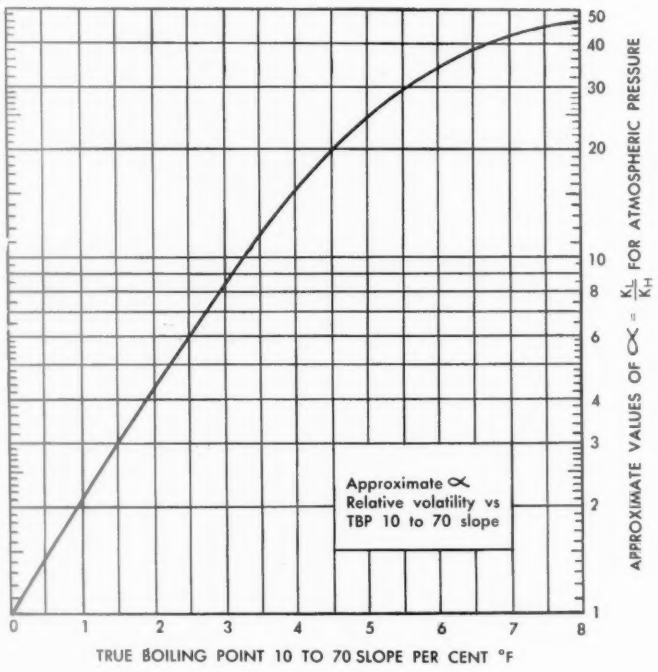

Approximate ∝
Relative volatility vs
TBP 10 to 70 slope
TRUE BOILING POINT 10 TO 70 SLOPE PER CENT °F
APPROXIMATE VALUES OF ∝ = K_L/K_H FOR ATMOSPHERIC PRESSURE

**FIG. 54. Approximate values of relative volatility as function of TBP slope.**

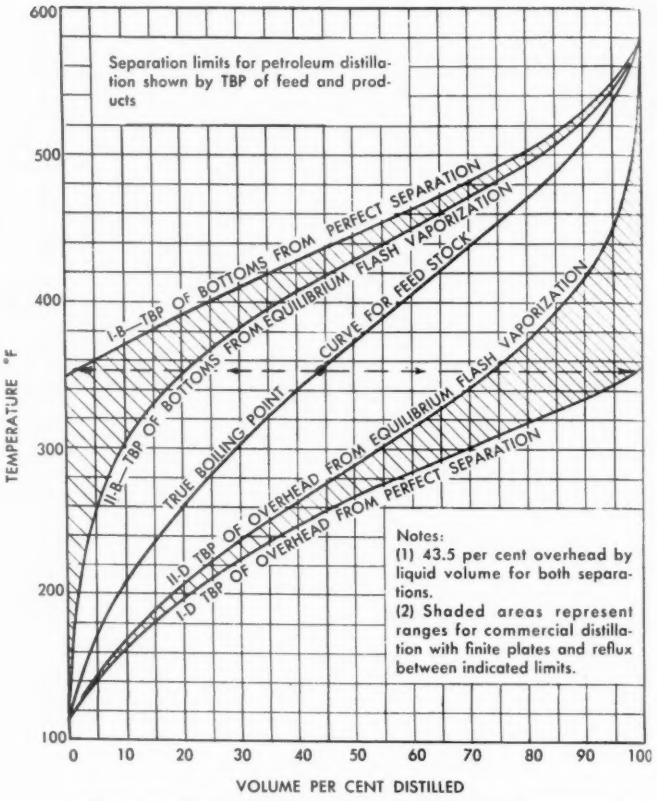

Separation limits for petroleum distillation shown by TBP of feed and products
I-B—TBP OF BOTTOMS FROM PERFECT SEPARATION
II-B—TBP OF BOTTOMS FROM EQUILIBRIUM FLASH VAPORIZATION
CURVE FOR FEED STOCK
TRUE BOILING POINT
II-D TBP OF OVERHEAD FROM EQUILIBRIUM FLASH VAPORIZATION
I-D TBP OF OVERHEAD FROM PERFECT SEPARATION
Notes:
(1) 43.5 per cent overhead by liquid volume for both separations.
(2) Shaded areas represent ranges for commercial distillation with finite plates and reflux between indicated limits.
TEMPERATURE °F
VOLUME PER CENT DISTILLED

**FIG. 55. TBP distillation curves illustrating separation limits, i.e., between flashing and perfect fractionation.**

## EQUILIBRIUM LINES FOR EFFECTIVE KEYS

In some distillation calculations for complex mixtures such as petroleum fractions it is necessary to employ effective or hypothetical keys. In the next chapter the Hengstebeck method suggests a method of estimating such keys. Another method is suggested by comparing Fig. 21 (Part 3, *The Petroleum Engineer*, July, 1947) with Fig. 40 (Part 10, February, 1948). Fig. 21 was prepared from the T.B.P. distillation data on equilibrium vapor and liquid from single stage flash vaporization separation. Fig. 40, on the other hand, was prepared from the X-Y-$\alpha$ equation for binary equilibrium.

It will be noted that these two plots are very similar and have a definite relationship. The information given on both these diagrams may be represented by a single XY plot, such as Fig. 53, if the relationship between $\alpha$ and the slope of the T.B.P. curve is given separately, as in Fig. 54. The relationship shown in Fig. 54 suggests a method of finding the equilibrium line from a T.B.P. curve.

## SEPARATION LIMITS

The development of an accurate multicomponent fractionation design method, whether theoretical or empirical, is a complex problem. It is always helpful to have the limits for the separation being studied. As mentioned above, the minimum plates and minimum reflux required for a given separation represents one set of very useful limits. Another set of limits is illustrated by Fig. 55 where the separation limits are defined by the qualities of the overhead and bottoms products for two extreme cases of operation namely, flash vaporization and perfect separation. On Fig. 55, the qualities of the products are represented by the TBP curves, which may be readily compared with the TBP distillation of the feed stock.

In both extremes the amounts of overhead and bottom products are the same, i.e., 43.5 vol per cent and 56.5 vol per cent, respectively. In Case I, the split is perfect, the only overlapping being the slight amount that might be caused by the component at the cut point being divided between overhead and bottoms. This perfect separation would require infinite plates and total reflux, an unrealizable case. The product distillations are represented by curves ID and IB. These curves are obtained directly from the TBP curves of the feed by simply spreading the points to the desired volume per cent scale. Case II, on the other hand, represents the other extreme that would be obtained by flash vaporization of the charge stock with no reflux and no plates. The qualities of the overhead and bottoms products in this case are given by the TBP distillation curves, II D and II B, which are obtained by making empirical or component type equilibrium flash vaporization calculations and plotting.

The shaded area between these limits represents the range of operation for a feasible installation of equipment operated at a commercial reflux ratio. The location of the commercially obtainable distillation curves between these two limits is determined by the number of plates and the reflux ratio in some manner yet to be estimated. It appears entirely feasible that an empirical method could be devised for locating these lines. This would be a very useful method, which would be applicable to fractionation calculations made in terms of components or in terms of distillation curves. In this connection, it should be pointed out that only TBP distillation curves may be used in this way. There are too many irregularities in the ASTM curves.

Parts 14 and 15 were written as one installment and divided, thus resulting in several cross references.

### References

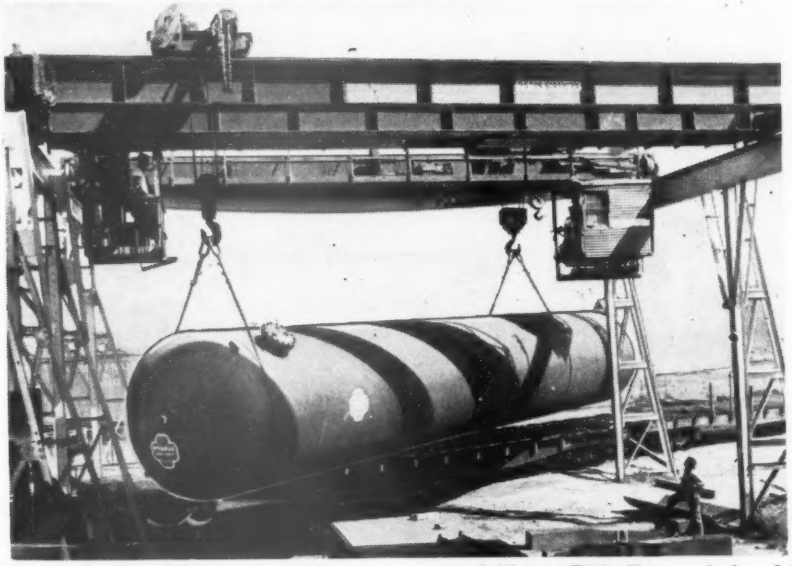

1. Bailey, R. V. and Coates, J., *Petroleum Refiner*, 27, 30 (1948).
2. Brown, G. G., Souden, M., Jr., and Nyland, H. V., *Ind. Eng. Chem.* 27, 383 (1935).
3. Brown, G. G. and Martin, H. Z., *Trans. A. I. Ch. E.* 35, 679 (1939).
4. Colburn, A. P., *Trans. A. I. Ch. E.* 37, 805 (1941).
5. Fenske, M. R., *Ind. Eng. Chem.* 24, 482 (1932).
6. Gilliland, E. R., *Ind. Eng. Chem.* 27, 260 (1935).
7. Gilliland, E. R., *Ind. Eng. Chem.* 32, 1101 (1940).
8. Gilliland, E. R., *Ind. Eng. Chem.* 32, 1220 (1940).
9. Hengstebeck, R. J., *Trans. A. I. Ch. E.*, 42, 309 (1946).
10. Jenny, F. J., *Trans. A. I. Ch. E.* 35, 635 (1939).
11. Jenny, F. J. and Cicalese, M. J., *Ind. Eng. Chem.* 37, 956 (1945).
12. Scheibel, E. G. and Montross, C. F., *Ind. Eng. Chem.* 38, 268 (1946).
13. Smith, R. L., *Trans. A. I. Ch. E.* 37, 333 (1941).
14. Underwood, A. J. V., *Trans. Inst. Chem. Eng.* (London) 10, 112 (1932).


*Part 15, which will be published soon, will deal with short cut and empirical theoretical plate calculation methods.*

* * *

# REFINERY VESSELS

- BUBBLE TOWERS
- PRESSURE VESSELS
- SCRUBBERS
- DRUMS
- STORAGE
- ABSORBERS



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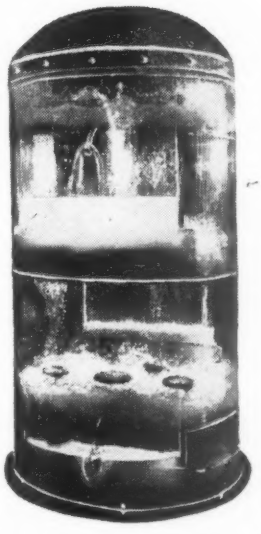

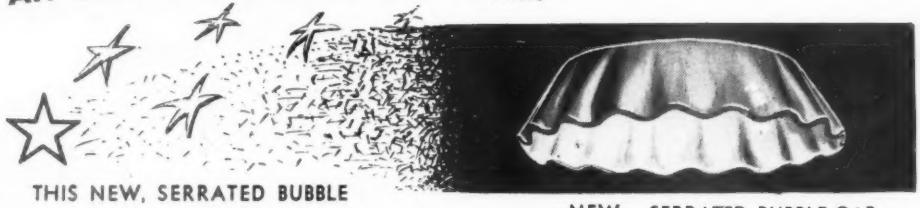

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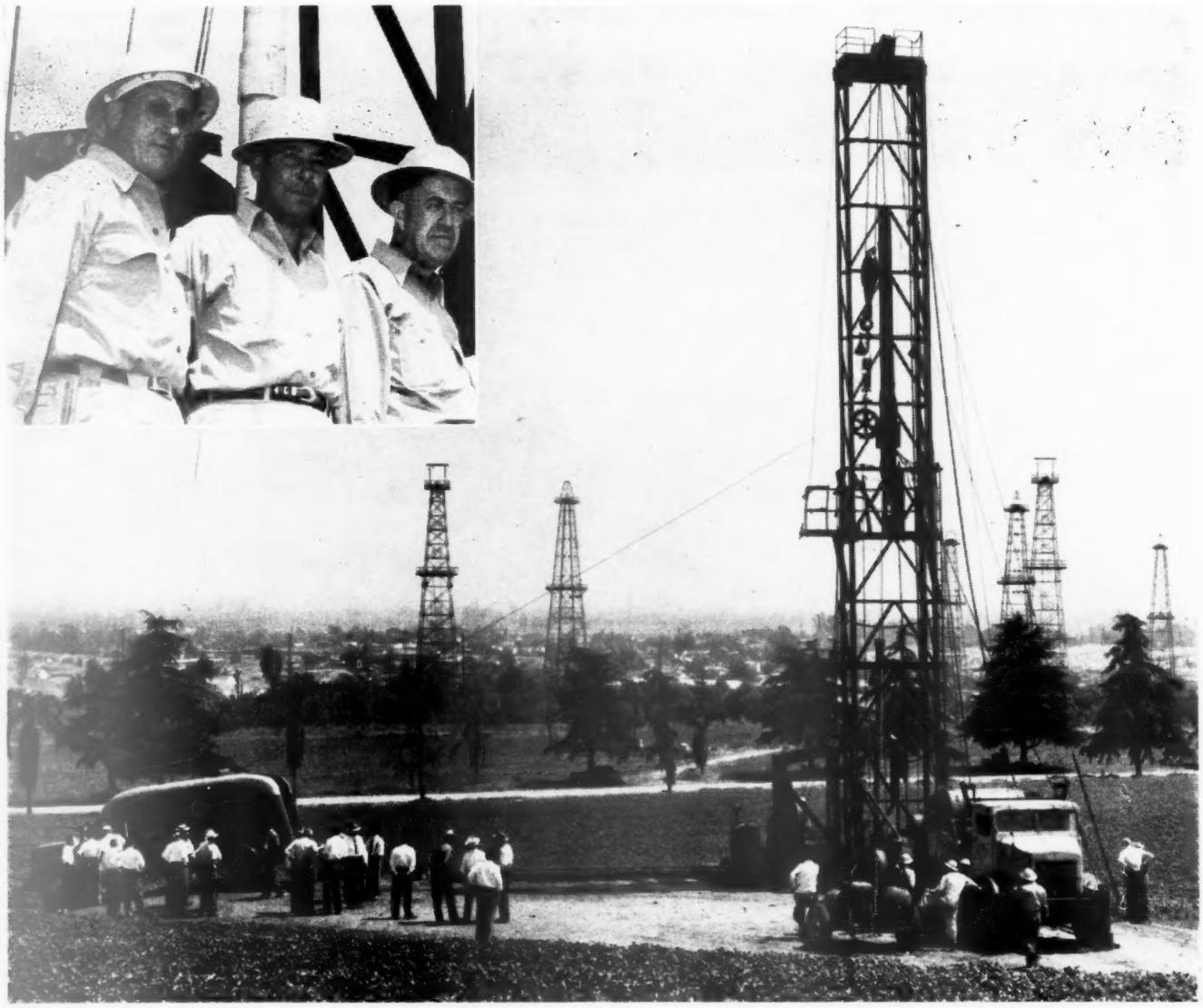


La Merced 17 at Montebello, California, is the scene of the historic Lane-Wells 100,000th gun perforation job, also the scene of the first such job ever performed by the company. This was taken before the big crowd had arrived. In the insert are the men who worked on both the first and 100,000th gun perforation jobs. They are: Bill Allen, Marty Reitzel, and Doc Stewart.

# Celebrate 100,000th gun perforating job

By RICHARD SNEDDON, *Pacific Coast Editor*

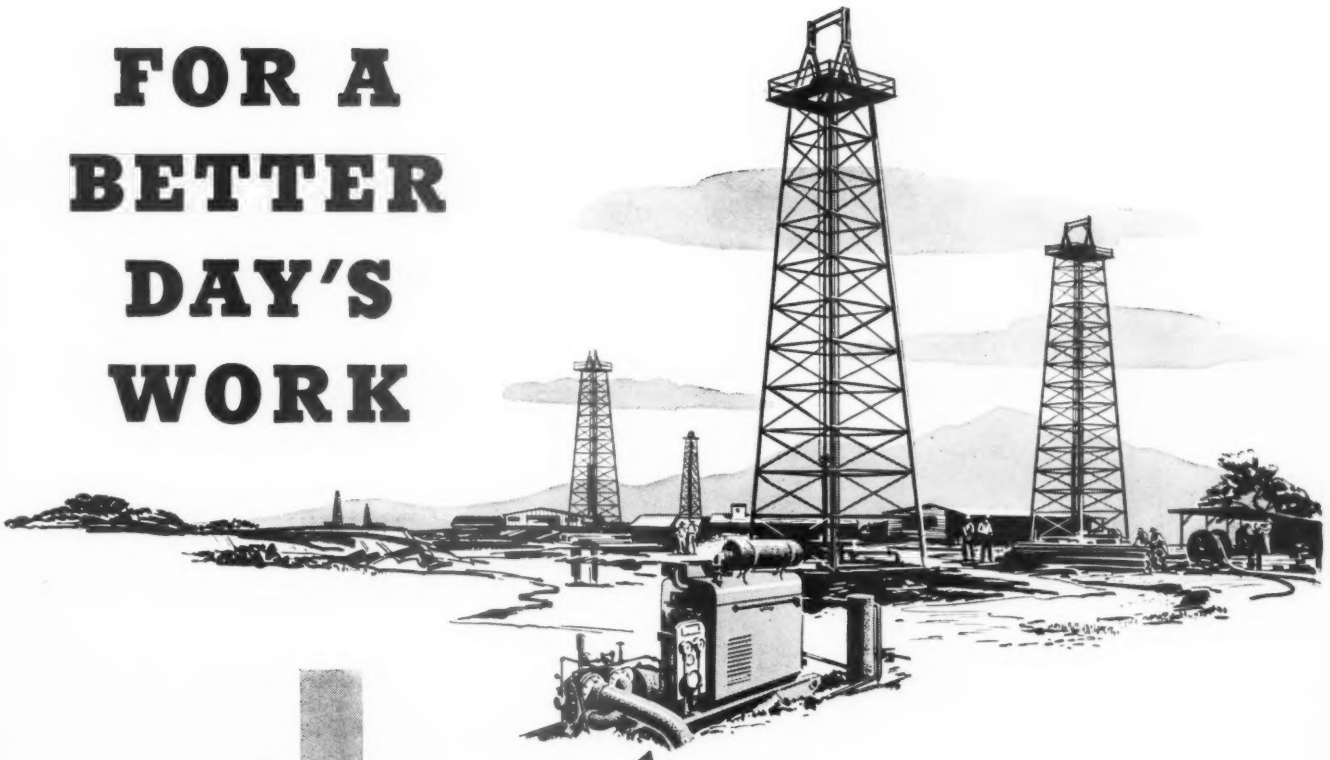
UNION OIL COMPANY'S La Merced No. 17, in Montebello, California, was the well on which Lane-Wells performed its first gun perforation job 15½ years ago.

**EXCLUSIVE**

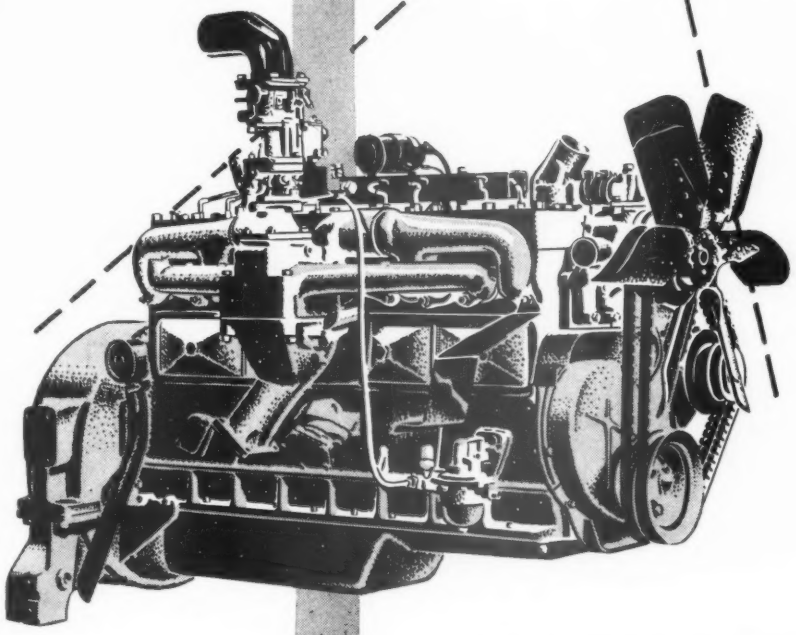
It was also the scene, on June 18, 1948, of a colorful ceremony, when officials of both companies and a host of invited guests gathered to witness a repeat performance—Lane Wells 100,000th gun perforation job. Among those who assembled to celebrate this interesting event were several well known oilmen who had also been present on the first occasion. A. C. Rubel was expected to be there, but at the last minute was obliged by some unforeseen contingency to pass it up, and sent as his substitute his genial aide, Sam Grinsfelder. It is not surprising that Union Oil's vice president, "Cy" Rubel, should have been implicated in the original test. It has always been his policy to foster new ideas in petroleum equipment and technique, and many a design engineer has had occasion to be thankful for his encouragement and advice.

One Union Oiler who was actually present at both parties—and he states that the first was a much more serious affair—was the self-effacing Hi Winter, as fine an engineer as there is in the oil business, and a man of wide experience in all phases of field work. Among the repeaters for Lane-Wells was Walter Wells, chairman of the board for the company, who had watched rather anxiously the first field test of the gun he

# FOR A BETTER DAY'S WORK



**IN OIL FIELDS — ON FARMS — IN FORESTS — IN INDUSTRY AND ON THE HIGHWAYS!**



● Today, as never before in our history, oil production is of key importance to the nation. Powered equipment which pumps "black gold" out of the earth must give peak performance in the vital job that lies ahead. That's why Chrysler Industrial Engines are specified in so many makes of powered equipment—why they're called on for the toughest tasks around drilling rigs. Their horsepower has a pedigree of unfailing performance, backed by Chrysler's engineering and production skill. Yes, wherever gasoline engines are depended upon for flexible, economical power, users are finding that Chrysler Industrial Engines are *Built For A Better Day's Work!*

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## INDUSTRIAL ENGINES

**HORSEPOWER WITH A PEDIGREE**

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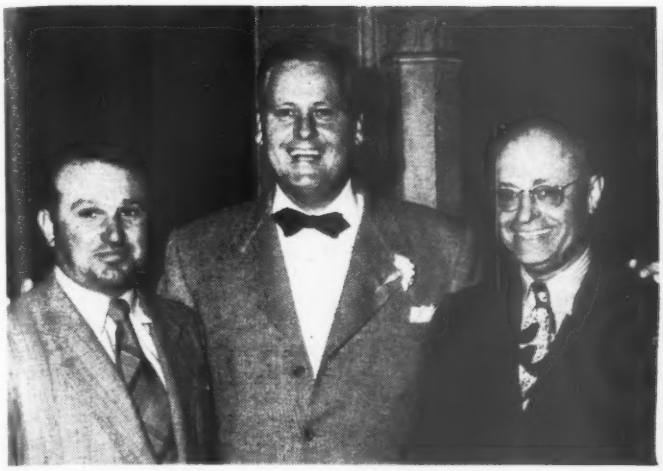
**In this candid shot, Walter Wells appears to be having difficulty releasing the christening water from its container. Left to right: Bill Eggleston, Sam Grinsfelder, Walter Wells, George Turechek, Hi Winter, and Rodney Durkee.**

had worked hard to develop. On the occasion of the 100,000th job, however, Mr. Wells showed not the slightest sign of anxiety, but to the contrary enjoyed himself thoroughly as he "christened" the latest type gun, and generally made himself pleasant to everyone around. George Turechek, chief design engineer for Lane-Wells, and one of the country's outstanding authorities on ballistics, was on hand. George is a modest individual, but he designed the first gun, and was right there on the La Merced well to fire it in that first test. Then there were Bill Allen, Doc Stewart, and Marty Reitzel, members of the No. 1 crew, and present to do the shooting on the 100,000th job. They looked mighty chipper, too, after 15½ years of strenuous endeavor.

It exemplifies the progressive spirit of the oil industry that gun perforation, a highly important development in the production of oil, should have grown from virtual infancy to its present advanced scientific status in less than 16 years. It also speaks well for our system of free enterprise that in the same time, the firm that developed the gun perforator could have evolved from a tiny two-man machine shop to one of the world's largest oilfield service companies, doing millions of dollars worth of business in all parts of the world. General approval of these accomplishments is attested by the wide interest displayed in the shooting of the 100,000th perforation job, and by the large attendance of oil executives, supervisors, trade and business paper representatives, and business men generally.

Mention has already been made of a number of Union Oil Company officials who attended the celebration. Others were Bill Eggleston, chief petroleum engineer; Charlie Perkins, assistant manager of purchases; Lou Kelsey, district production foreman, and Sam Paulson, production foreman. From Lane-Wells came Rodney S. Durkee, president; Jim Hughes, sales manager; Norman Dorn, chief engineer; Morton T. Higgs, manager of field operations; James McPhee, manager California division; Val Forsyth, engineer, and others. Many oil companies and equipment manufacturers besides the two principals were rep-

**Some of the Lane-Wells representation: George Flanders, Russell Norelius, Morton T. Higgs, Jas. D. Hughes, J. W. McPhee, Russell Keener, Val Forsyth, Ray Hancock, and Norman L. Dorn.**



**Big, jovial Jim Hughes poses with two of his guests at the Los Angeles Biltmore. Left to right: Jean J. Mothre, Autonome des Petroles, St. Gaudens, France; Jim Hughes, sales manager, Lane-Wells Company; and Jack Ballagh, Patterson-Ballagh division of Byron-Jackson Company.**

**Lou Kelsey, Union Oil Company's district production foreman, and Sam Paulson, production foreman at Montebello and Santa Fe Springs, pretend to be terribly occupied while they pose for a shot at La Merced 17.**

resented at both the field ceremony and the cocktail party that followed later in the evening.

This 100,000th perforation job assumes greater significance when the difficulties in the development of gun perforation are fully realized. The idea of opening the producing formations by firing steel bullets through casing and cement was not new in 1932. Sid Mims had patented an approach to the problem, but his patent had never been put into practicable shape. Lane-Wells cleared the way for their own gun perforator by buying the Mims' patent. Then the real work began. The gun, the hoisting equipment, the firing devices, the control methods—all had to be designed, built, and tested. A revolutionary method of electrical firing was invented. This not only provided wider firing selectivity, but also eliminated many prior difficulties, and provided greater operating safety. Finally, Walter Wells' perfection of an armored conductor cable removed almost the last barrier to successful gun perforation.

Then came the slow, disheartening business of convincing practical oil operators of the value of a new and untried tool. The latter felt, understandably enough, that the gun might do some lasting damage to their wells. Union Oil Company, long noted in the industry for its progressivism, was first to allow a test of the new gun on one of its wells. On December 12, 1932, a small group gathered around La Merced No. 17. It had been off production for three years and was to all intents ready for abandonment. With great care the first gun perforation job was completed. Its effect did much to banish skepticism. La Merced No. 17 went back on production, and in the next 15½ years produced a quantity of oil equal to three-quarters of its entire yield prior to the date of perforation. It is believed that the 100,000th job, done on the same well, will add more years yet to its productive life.

An interesting commentary on the subject of gun perforation was made editorially by K. C. Sclater in the March, 1935, issue of *The Petroleum Engineer*, in part, as follows:

"Some time ago in this column the fact was brought out that the development of new practices in the industry might, overnight, change many of our conceptions of matters of development. An example was cited of how the well-spacing problem might be profoundly affected by controlled directional drilling.

"Now along comes another development that may be equally potent in influencing the well-spacing problem. This time it is the practice, recently developed, of perforating well casing and oil sands with a gun perforator. By use of this device the sand surrounding the well can be perforated; channels can be artificially made to allow the oil to drain more freely into the hole. The so-called 'keystoning' effect may no longer be a problem if the permeability of the sand in the immediate vicinity of the bore-hole can, in effect, be altered. In other words, modern science has made another step toward modifying what, not so long ago, was thought to be unalterable.

☆ ☆ ☆

**Lands under lease by oil and gas operators in the United States are said to total more than 125,000,000 acres and most of this vast area is being explored for oil and gas.—*The Petroleum Data Book*, Dallas, Texas.**

"What can be and actually is being done today in this connection is really tantamount to increasing to any desired degree the permeability of the producing sand in the vicinity of the well. The gun perforator, the significance of which perhaps is not yet fully appreciated, does it. It is a development revolutionary in its scope because it can be applied to change the natural fundamental characteristics of a well's flow.

"Bullets from the perforator gun can be made to penetrate the producing horizon from three to eight feet at any desired point. Each bullet leaves in its path a clean hole about a half-inch in diameter; a hole that serves as a radial channel in the sand through which the oil and gas can flow with ease into the hole. In effect, the permeability of the sand surrounding the well is increased.

"Perhaps the most important point of this development lies in the fact that the natural permeability of the sand, heretofore considered fixed and unalterable, may be modified to any desired degree in the immediate vicinity of the well. The extreme importance of the permeability of the sand at this point has been brought out by laboratory investigation. Modifying the permeability of the sand in this manner will have some influence on the drainage area of the well and hence will have an effect on well-spacing. Moreover, who can tell what further development tomorrow will bring forth? It is not unreasonable to anticipate that much greater penetration of the sand will be possible in the future. When that day comes, it may be that much of the theory on the flow of oil and gas through sands will be thrown into the discard."

The problems involved in successful gun perforating are not realized by those who are not directly concerned.

As with other oil tools, the answering of each problem merely opens up new channels for thought and improvement. Primarily come the choice of steel with the requisite physical properties and the correct alloy to withstand the shock of detonating explosive. Then there are endless considerations relating to machinability, ductility, strength, corrosion resistance, and many other physical factors. The exact shape and composition of the bullets to give the best results are matters that have been subjected to experimentation for years in laboratory and field. Oil production was so important during the war that the research and testing on Lane-Wells bullets was continued with full governmental sanction. The problem of deeper penetration of the formation, despite the increasing use of higher quality steel in oil field tubular goods, was answered by the development of the ogival point "Steelflo" bullet. It took thousands of tests to determine the ultimate shape and structural qualities of this missile.

The apparently logical answer to the need for further penetration — pack more powder behind the bullets—is actually erroneous. All projectiles have a natural tendency to "tumble," that is, to turn over butt end first. The barrel of the perforation gun is very short and does not permit of controlling the flight of the bullet by rifling the bore. Hence, there must be the most careful balance between bullet, barrel, chamber, and propellent. Too great a charge merely aggravates the end-over-end tendency. In such instances it tumbles and fails to give sufficient or proper penetration.

The demands on the powder used in gun perforating are believed greater than on powders used in regular ordnance. The correct compaction and speed of burning are very important. When one considers also the conditions under which the powder must function, the difficulties of the situation are easily realized. Down-hole conditions of fluid, hydrostatic pressure, temperature, etc., provide a variety of conditions that explosives are not ordinarily required to face. To overcome the wide range of prevalent conditions, Lane-Wells uses two different powders. Both are packed in fiber containers, with electric ignition wires buried inside the powder mass to avoid misfires.

As gun perforating employs explosives, it is necessary that stringent safety measures be observed during its use. To aid in this, a five-point firing system has been devised that is rather simple. The simultaneous action of both the shooter at the control panel and the rig man on the derrick floor are required to fire the shot. The process is so arranged that neither the made-up charges nor the gun itself is ever "live", except when they are actually positioned in the well. It should be noted also that the powder is a cellulose nitrate base compound that cannot be detonated by dropping or by other shocks resulting from careless handling. It is completely safe until it receives the electric detonating impulse from the gun. Lane-Wells is proud of the fine safety record it has compiled in its many years of gun perforating.

Although gun perforating was basically designed to bring in production, it now has many associated uses. It is employed, for example, in squeeze cementing; for testing water shut-off, and for multiple zone testing and completion. One of its popular modern applications is to perforate before acidizing. The funnel-shaped holes left by the bullets in limestone or sandstone aid the acid in opening drainage channels in the formation. As the sides of such holes are a maze of cracks and fissures, the acid penetrates far more deeply than it does when working directly on the face of the formation.

During the 15½ years covered in its first 100,000 gun perforation jobs, Lane-Wells has fired more than 5,000,000 bullets, nearly all of which found their mark—the record is 97 per cent gun perforating efficiency. No estimate can be made of the steel saved by single string completions made possible through gun perforation, but the quantity is admittedly great. It has, however, been estimated that gun perforating has added more than 200,000,000 bbl of oil to the production record that could not have been recovered by any other means. Any method, tool, or service, that can to such an extent conserve one of the world's most valuable natural resources is certainly worthy of universal approbation. ★ ★ ★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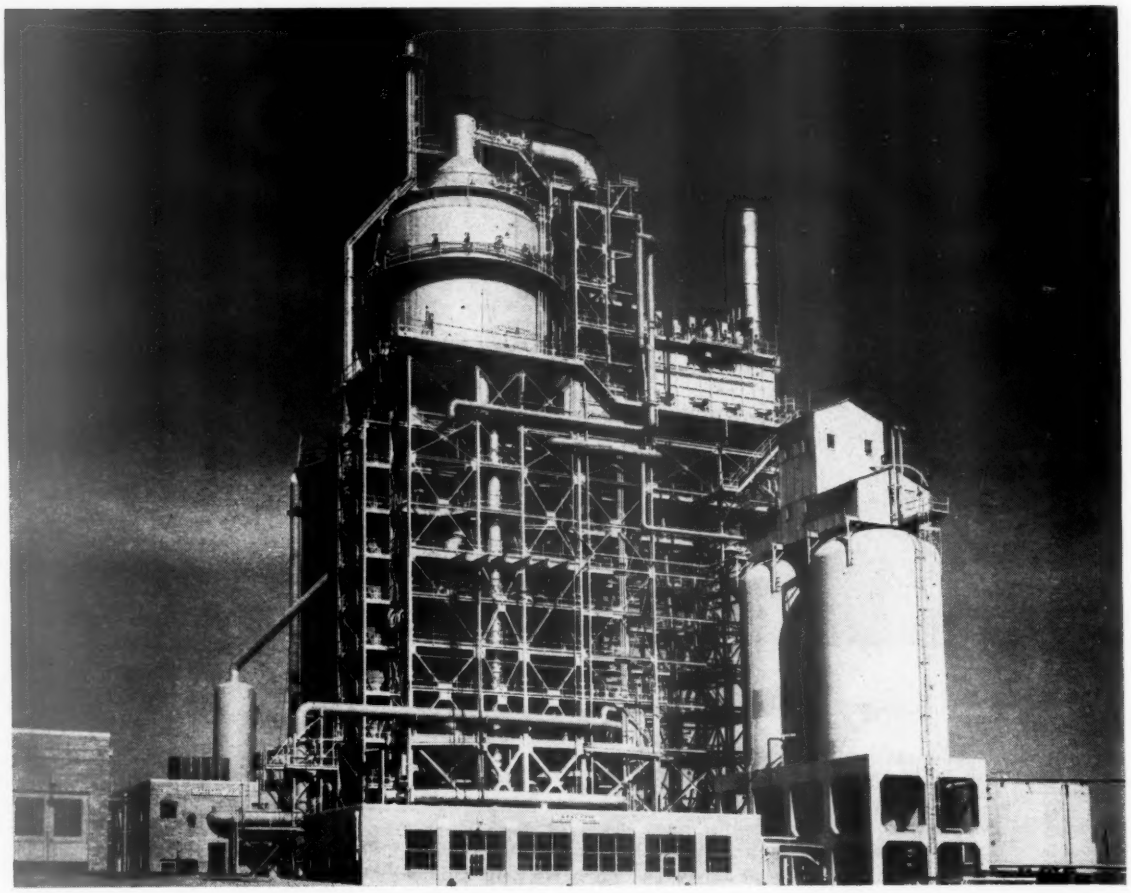

**The production heart of the Sunray Oil Corporation's refinery at Duncan, Oklahoma, one of the largest catalytic cracking units in the world. This giant unit will take up to 20,000 bbl of gas oil charging stock per stream day for production of high quality, high octane gasoline.**

# Oklahoma refinery remodeled

AFTER thorough testing, the 20,000-bbl-a-day fluid catalytic cracking unit at the new Sunray Oil Corporation refinery at Duncan, Oklahoma, went on stream recently to give Oklahoma one of the Southwest's most modern refining units for peacetime production of high octane quality gasoline and other petroleum products.

The 85-acre refinery, purchased by Sunray from the War Assets Administration in August, 1947, has been completely remodeled to peacetime use by re-arrangments of existing equipment plus new construction completed on a record-breaking schedule.

The major acomplishment of Sunray engineers can be realized in view of the fact that while during the war not a single barrel of crude was completely processed within the plant, a 20,000-bbl-per-day crude topping unit was completed and in use only 65 days after acquisition.

Today, complete topping and catalytic cracking operations, a 10,000-bbl-per-day vacuum unit, a 5000-bbl-per-stream-day viscosity breaking unit, a 6-unit electrolytic desalting unit, a gas concentration unit, and a polymerization unit for the production of butanes and propanes are in operation.

The 20,000-bbl charge to be fed each day to the new Sunray plant is expected to produce 4000 bbl of straight run gasoline, 2000 bbl of No. 1 distillate, 2000 bbl of No. 2 burning oil, 7000 bbl of catalytic gasoline, and approximately 4500 bbl of fuel oil. Less than 2½ per cent, or less than 500 bbl, loss is anticipated.

A 96-mile 6-in. pipe line has been laid to Sunray's first Oklahoma plant at Allen for the exchange of gas oil, gasolines, and other products. Pump stations have been built at Allen, Wynnewood, and Beckett, and eight additional 80,000-bbl storage tanks erected. In addition to this refinery pipe line, an 8-in. line has been laid to the nearby Velma field as a crude oil line. Additional crude oil gathering lines are now being laid in the area.

The refinery is in the heart of the most active Oklahoma producing field, where proved underground reserves should give ample supply of crude for years to come. The Sunray catalytic cracking unit is one of the largest in the world, and will produce gasoline of an exceptionally high octane quality. New modern polymerization and gas concentration units also give the plant a high production of special fractions in a fully rounded processing program.

The remolding work at the plant was done according to specifications of the Universal Oil Products Company, licensor of the fluid catalytic cracking process employed. The topping plant, vacuum, vis-breaking units, and the poly plant were constructed by the Refinery Engineering Company, of Tulsa and Chicago, and Sunray's own engineering staff.

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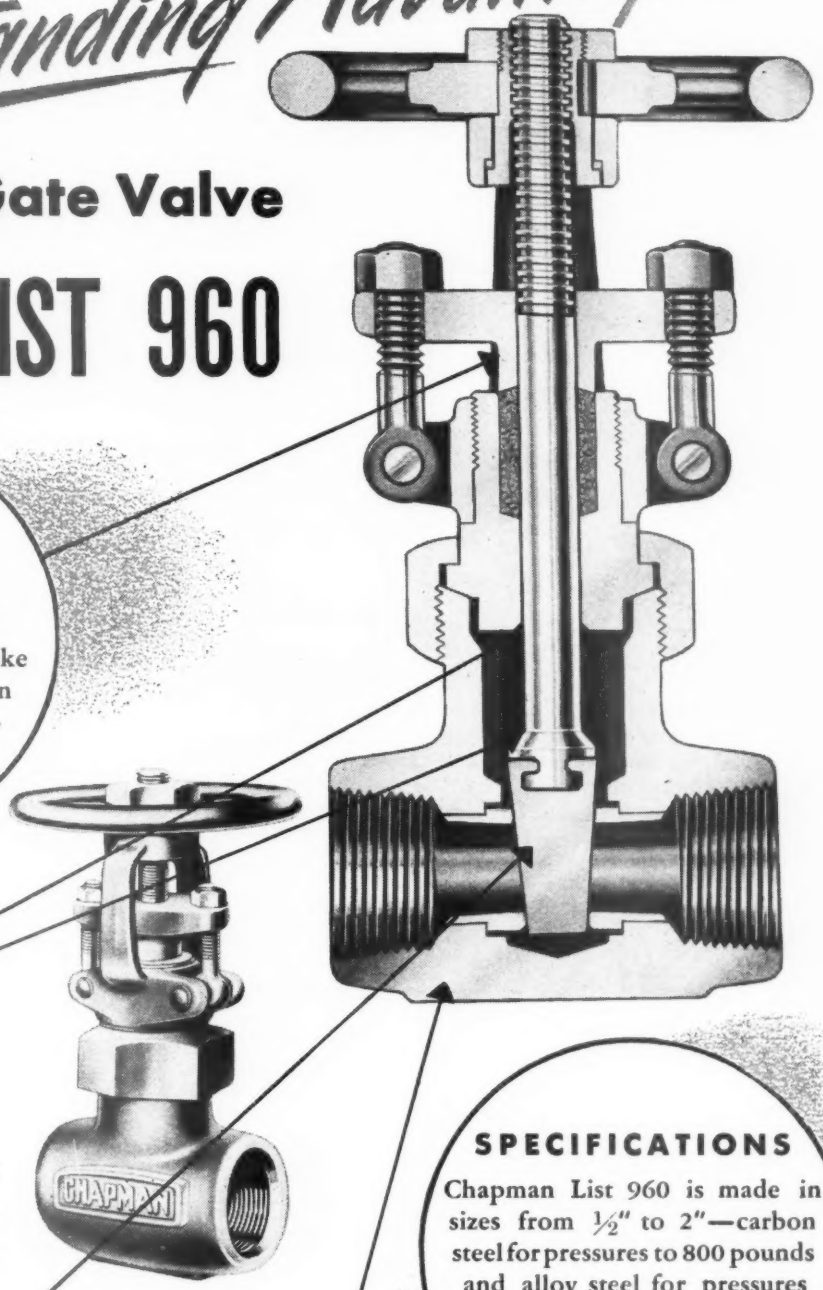


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Chapman List 960 is made in sizes from ½" to 2"—carbon steel for pressures to 800 pounds and alloy steel for pressures to 1,000 pounds, at 750°F. For higher pressures, specify List 990.

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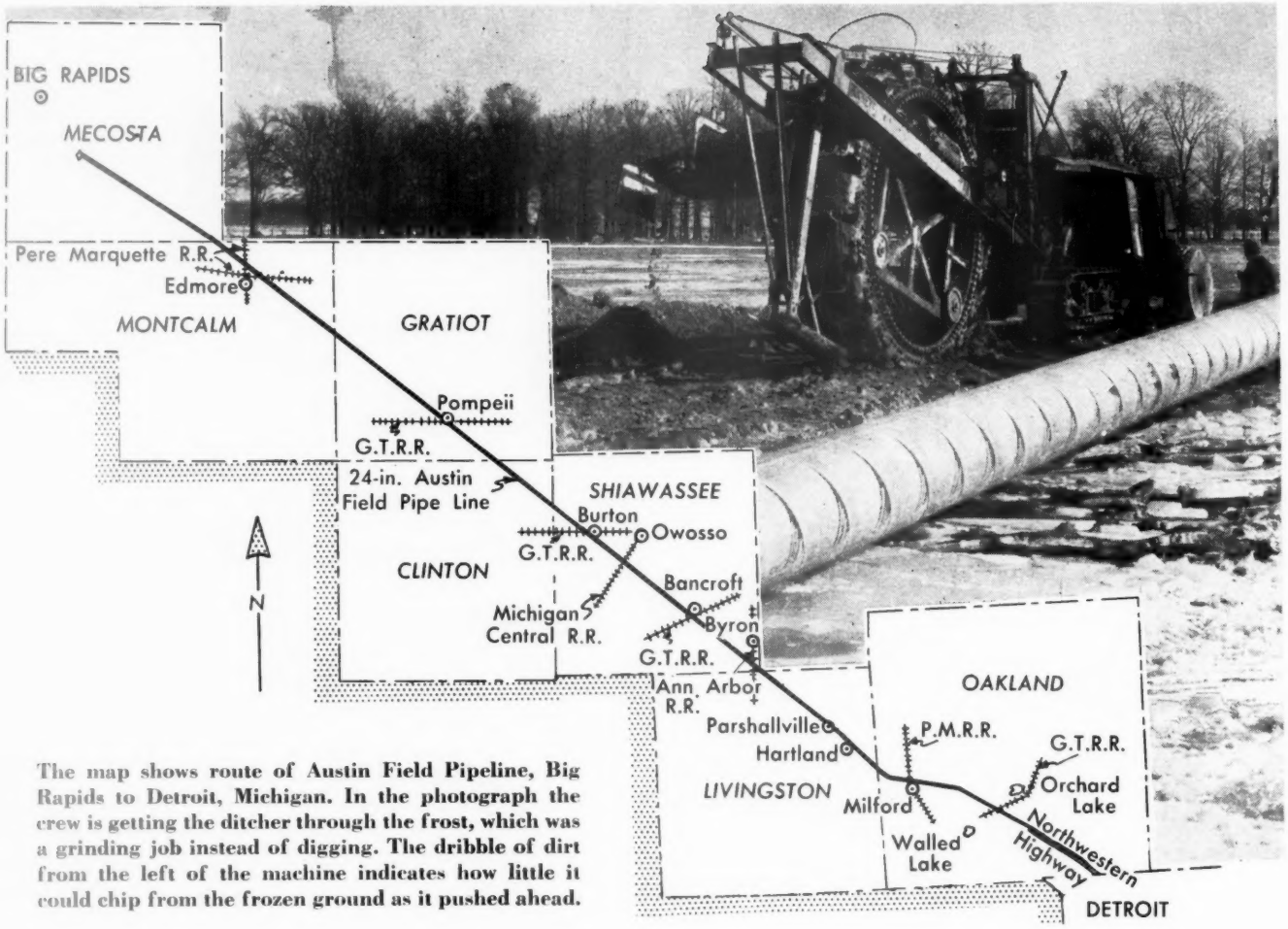


**The map shows route of Austin Field Pipeline, Big Rapids to Detroit, Michigan. In the photograph the crew is getting the ditcher through the frost, which was a grinding job instead of digging. The dribble of dirt from the left of the machine indicates how little it could chip from the frozen ground as it pushed ahead.**

# Pipe line crews battle blizzards, floods

By HAL FRY

"THE toughest 153 miles of pipe line ever to go into the ground."

That is what the old-timers called the Austin field pipe line across Michigan—

**EXCLUSIVE**

153 miles of 24-in. pipe linking the Michigan Consolidated Gas Company's Detroit distribution system with the old gas fields in Mecosta County, Michigan, and intended to serve later as the final section of the Michigan-Wisconsin pipe line.

Begun in December with a May 15 deadline for completion, the line was engineered by the Ford, Bacon and Davis Company of New York. The J. R. Horrigan Construction Company of Houston built the northwest 139.5 miles; the R. L. Coolsaet Construction Company of Detroit the 13.5 miles within the city limits of Detroit.

Under ordinary circumstances the job would have made no special pipe line history. The terrain it crossed is flat or gently rolling clay and sandy land with occasional peat bogs along the right-of-way. No major rivers stood in its path.

Except for the fact that along the way was as high a percentage of tile-drained farms as ever faced a pipe line construction crew, no special problems would have been encountered.

The pressure of time made the difference. Battling as a main contender in one of the biggest gas-market rivalries in history, Michigan Consolidated could not give the go-ahead in time for field work to start before late fall of 1947.

The distributor faced a huge demand for natural gas in the Detroit area, and had been experiencing acute winter shortages at peak demand. Available to them through the summers, however, was enough gas so that they could store up to 8,000,000,000 (billion) cu ft of the fuel this summer in the old north Michigan field—if the pipe line could be completed in time.

So the job had to be done in the dead of winter and the mire of spring.

It turned out to be the bitterest winter and one of the wettest springs in the history of the state, where long-continuing sub-zero temperatures, snow-storms, and deep-penetrating frost are no winter novelty.

Through blizzards and temperatures down to 25 F below zero, therefore, the job was done. Working across snow-covered land, surveyors were unable to tell a great deal about the terrain they traversed—and at many points unknowingly routed the line across bogs that became almost impassable in the spring thaw.

Construction crews, shivering under heavy coats and gloves and earflaps, chipped their way into rocky frost reaching four or more feet into the ground at many points. Ditchers stalled and digging edges of tools blunted in the effort to cut through. In many places the surface had to be chipped through with dynamite before backhoes and draglines could make any headway.

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Above, where the frost was too tough they drilled and blasted it. Below, operation normal. While ground was still frozen a pond near Elsie, Michigan, raised this kind of hob with the ditching. A dike off to the right, a conduit from the pond out through the pipe across the center, try to keep new water out, while the pump works away at removing what is already in and the dragline tries to clean out the caved-in mess that was once a pretty good ditch.

LOW COST POWER handles the biggest jobs—pipe lines, refineries, multiple pumps—with trouble-free efficiency. If the job is only a fractional horsepower motor, Utility Electric LOW COST POWER is your best bet, too. You get all the advantages of low operating, maintenance and labor costs . . . easy portability . . . fast starting in all weather . . . s-l-o-w depreciation. Save on the initial cost of power-driven equipment. Save on repairs. Call your nearest Utility Electric Power Company. The Power Engineer will show you how LOW COST POWER fits into your picture.

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**With spring came mud.**

A late spring finally eliminated the frost and cold problems, but brought new ones in their places. In the interim the crews had combinations of the worst of winter conditions and the worst of spring to contend with.

Finally the high spots, where the frost had virtually barred progress earlier, became easy. But the low-lying areas, in turn, passable in the winter, became quagmires and lakes under some of the worst flooding conditions in Michigan history.

Heavy machinery sank through in bottomless peat bogs and quicksand. Ditches filled with water and at many points collapsed.

For a time, despite herculean effort on the part of all, it appeared highly doubtful that the line could be completed by the May 15 deadline. Extra equipment was pulled in, however, and a month-long surge of tooth-clenched effort in which many men worked 18, 20, and 22 hours a day, pounding steadily around the clock, turned the tide.

At 11:52 p.m. May 13 outside the sleeping village of Bancroft, Michigan, engineering and construction heads stood triumphantly by, up to their ankles in mire and blinking in the glare of truck headlights, hand torches, and a rich-burning oxyacetylene torch to watch the welders finish the final tie-in and close the job. By 6 a.m. May 14 gas was rushing through the line.

Both E. V. Hunt, division engineer for Ford, Bacon and Davis, on the job at its conclusion, and Ben Law, Horrigan general superintendent on the project, declared the work could never have gotten under the wire but for almost superhuman effort on the part of workers who hammered away long days, seven days a week for some six months.

Construction men who saw the job through—many of them with 20 or more years of experience in pipelining—agreed uniformly that it was the toughest job in their experience. Many commented that they could never have believed before the job that a combination of weather conditions could turn a routine assignment into as difficult a job as a pipe line crew ever faced.

Here, in general, is the reason for the line, a segment of the Michigan-Wisconsin job scheduled for completion in 1950.

Michigan Consolidated, supplied with natural gas from north Texas and Oklahoma fields by Panhandle Eastern Pipe Line Company under a contract expiring in 1950, earlier anticipated and in the winter of 1947-48 encountered critical shortage of supply under peak winter loads.

By this winter overall demand for the fuel had substantially outstripped the supply available to the company daily through Panhandle Eastern's line, and was still growing. This time the shortage brought shutdown and heavy layoffs in many major industries in the Detroit area and there was public clamor throughout the state.

With no immediate prospect of completion of the new 24-in. link to Texas and Oklahoma fields, or other prospects for relief, a way to back up reserves of gas during low summer demand against winter loads had become vital.

The Austin Field Pipeline Company project to exhausted gas fields in Mecosta County, northwest across the state, was the answer.

Through this line extra summer gas from Panhandle could be sent north and stored in the fields against heavy winter needs. Later the Michigan-Wisconsin line would tie in the Big Rapids end of the line and convert it into a main supply link for Michigan Consolidated's system.

Ford, Bacon and Davis and Horrigan,

**Puzzle picture: Just this side of the pipe line is the ditch.**

# Helping them to fly higher, faster, farther...

*Booster Jato rockets shorten the take-off runs of heavily loaded planes. Texaco provided a special asphalt which played an important part in developing an efficient fuel for this purpose.*

*Unitemp, Texaco's new lithium base grease which is able to function over a temperature range of from 70° below zero to 300° above, solves difficult lubrication problems on modern high-flying planes like the Boeing Stratocruiser.*

*New designs in long-range, high-altitude aircraft such as Navy's Lockheed Constitution constantly raise new lubrication problems. Texaco engineers found that Regal Starfak Special answered the complex service and temperature requirements of the giant landing gears of this 92-ton plane.*

THE work of keeping Texaco aviation fuels and lubricants abreast of the newest trends in aviation progress is typical of the intensive research and development with which Texaco meets the challenges of designers, engineers and operations men of the automotive, diesel, railroad, electrical and many other fields for fuels and lubricants to meet exacting requirements.

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**Concrete weights slipped off the pipe, and the line popped up like this.**

handling the Michigan-Wisconsin job, took on this hurry-up spur.

The project called for 139.5 miles of 24-in. line outside of Detroit and an additional 13.5 within the Motor City's limits capable of handling operating pressures up to 970 psi, and a compressor station at the Austin field end.

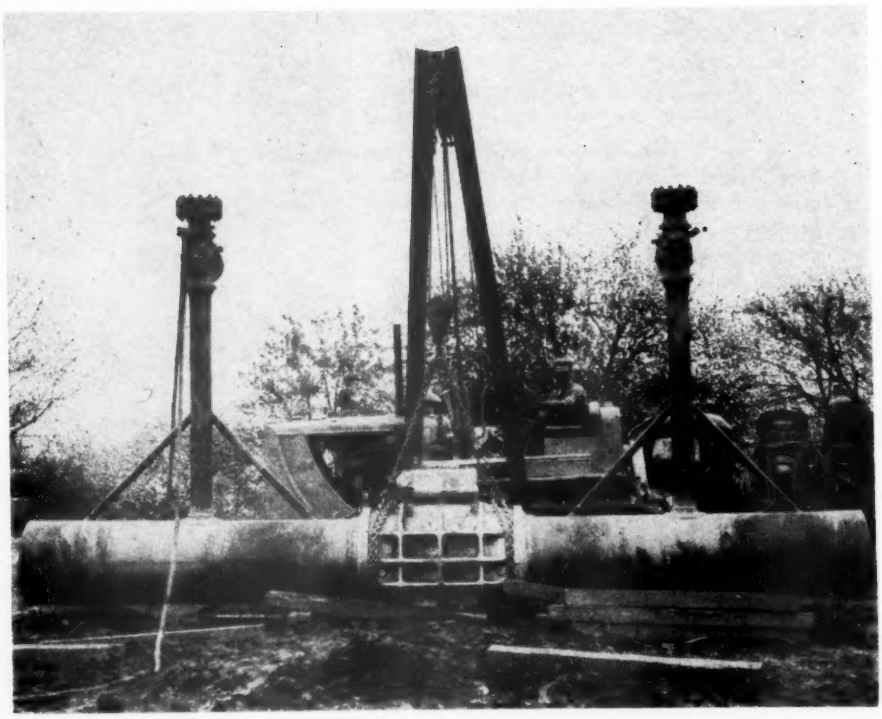
The pipe used was of 5/16-in. wall thickness and tested 1025 psig. Weight was 82.02 lb per ft—216.53 tons per mile. The 4-bead welding was done with 200 and 300-amp welding machines—the stringer bead with 5/32-in. rod, the rest with 3/16-in.

The pipe was coated with a hot enamel coating to an average thickness of 3/16-in. with a tolerance of 1/16-in. Holiday detectors checked for voids. Eighteen-inch kraft paper was spiral-wrapped over it.

The ditching was planned for a 36-in. wide trench ranging in depth from a minimum of about 50 in. to a maximum of about 9 ft where conflict with tile to be avoided or other special considerations forced the pipe down.

Ditching machines much of the time were forced to use 21-bucket rock-wheels and to overcut—and even this was useless at many points because of deep frost and other factors. Back-hoes and draglines augmented them for extra-deep ditching and on other special problems.

Use of pumps and dikes helped at some points where water crowded in even during the coldest weather of the winter, but could do little against the extreme water conditions of the spring.



**Ready to bring in the last shut-off valve near Owosso.**

At many points frozen ground was drilled and blasted to open the way for digging tools, turning a ditching operation virtually into quarry work. Clam buckets lifted out the chips. Cutting edges of digging tools were in many instances re-tempered to give them extra hardness against the rocky ground.

Although no major rivers were crossed, violent flood conditions in the spring turned every minor stream into a raging torrent. Passage of the line had to wait—sometimes for weeks—for water to subside. At one point a plan for floating heavy machinery out on the Maple River on rafts made of line pipe, to make possible lowering-in at high water, was considered but abandoned as impracticable.

Regular precast concrete river clamps weighing 2400 lb each were used at most points where buoyancy became a problem. At many points under water at the time of lowering-in but expected to be dry land where the pipe could be covered later, half-sections of these clamps were used—but created problems. When lack of adequate footing for heavy machinery in bog areas—even with corduroy work—existed, use of these clamps became difficult and erratic. Getting them into place was difficult, and occasionally they slipped off, allowing the pipe to bob to the surface. Finally cast-iron river clamps were substituted with greater success.

Gate valves installed approximately every 10 miles permitted isolation of short sections of the line for repairs and testing.

The clean-out job on the line, Hunt declared, demonstrated the effectiveness of the Hinzman internal pipe cleaner, a "pig" of spring-mounted knives fashioned from pipe sections and rubber disks in two articulated sections. The inventor, J. E. Hinzman, who served as chief inspector on the job, stood by to watch the first instance to his knowledge in which this cleaner had to negotiate a 90-deg turn in a pipe line—and made it.

The entire line was cleaned with a single cleaner, Hunt said, the "pig" showing no sign of damage from the job. The spoil, he said, showed that it not only took out dirt and scale, but re-

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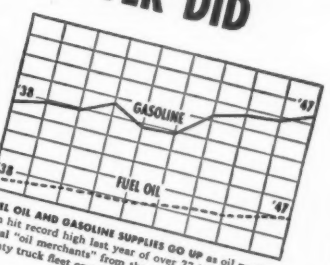


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Watching operations of holiday detector are: C. T. Dickeman, executive vice president, Austin Field Pipeline Company; J. R. Horrigan, president, and Ben O. Law, general superintendent, respectively, J. R. Horrigan Construction Company.

E. V. Hunt, division engineer for Ford, Bacon and Davis, and Harry Gable, general superintendent Austin Field Pipeline Company, stood by as delighted spectators when tie-in was made.

Welders make the final tie-in outside of Bancroft just before midnight, May 13.

moved many "icicles" left from welds along the way.

Proof that an unusually good cleaning job was obtained, he said, is the fact that in the first 10 days of operation the packings and bushings of the compressors at the Austin field station showed no evidence of wear or leakage.

The compressor station there has the unusual feature of being able to move gas in either direction along the line. Built by Ford, Bacon and Davis with W. D. Kleppinger supervising, it consists of three 1000-hp vertical compressor units.

The manifold piping is so designed that during the summer the station can pump gas from the Detroit end into the Austin field for storage. In cold months a valve manipulation on the manifold reverses the process, sending gas from the storage field to Detroit.

The existing compressor station of Michigan Consolidated at Allen Road in Detroit supplies needed pressure at the south end of the line.

The Austin field station is capable of a maximum delivery "in the neighborhood of 125,000 cu ft a day." Normal anticipated movement along the line until after completion of the Michigan-Wisconsin link will be about 35,000 cu ft a day.

The construction job outside of Detroit was handled in four spreads from construction and engineering headquarters set up in Owosso, Michigan.

Volney H. Kyle, Jr., Ford, Bacon and Davis project manager for the whole Michigan-Wisconsin job, was top man in the engineering work. Hunt served as division engineer during the final two months of the work, replacing W. J. McKeon. G. A. Moore was assistant division engineer.

Under Ben Law as Horrigan general superintendent served these spread "supers": First, Ed Flanagan, who took U. G. Ralph's place after the latter was killed in an auto accident mid-way through the job; second, W. H. "Squeaky" Law; third, Louis Visentine; fourth, H. R. Sommerville.

The first three spreads normally had about 115 men each — the fourth about 75.

On the Detroit spur of the line R. L. Coolsaet personally supervised his company in construction of its 13.5-mile section.

Under Hinzman as chief inspector served these spread inspectors: First, A. G. Miles; second, J. T. Morriss; third, Thomas G. Winkler; fourth, Pete Hiner, and on the Detroit spur H. C. Davis and R. L. Johnson.

L. B. Breed was chief accountant on the job. W. B. Sivley served as chief of the right-of-way department during most of the release work on the line. After he was moved on to work elsewhere on the Michigan-Wisconsin job Dan Williamson assumed his place.

During preliminary stages of the work a Beechcraft plane, usually stationed at Detroit and sometimes at Owosso, was used to expedite release work, and later for numerous other jobs where swift movement was needed. ★ ★ ★

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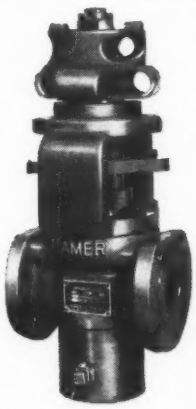
# *new and improved* machinery and equipment

**A REGULAR FEATURE**
*appearing in*
THE *Petroleum* **Engineer**
Irwin-Keasler Building
Dallas 1, Texas

### (1) Plug valve

Called the "Hot-Spot" this new model Hamer plug valve is designed to use on lines carrying asphalt, tar, and other services where heated valves are required. Heat is applied from a chamber on the lower part of the valve to which steam lines are attached. Heat is transferred through the body and the plug. The "Hot-Spot" valve also has the exclusive plug adjusting nut feature incorporated in all Hamer valves. The plug adjusting nut, situated under the plug head, when turned to the left acts as a powerful screw jack to lift the plug slightly in the body, freeing it for easy turning. This feature assures that the valve may be opened or closed under all conditions and will not stick. The plug adjusting nut when turned to the right lowers the plug into its seat and holds it in correct adjustment for routine operation. Hamer "Hot-Spot" valves are now available in sizes 2, 2½, 3, and 4 in. Larger sizes will be marketed presently.



### (2) Air starting motors

Ingersoll-Rand Company is now producing air motors of two sizes as starters for internal-combusion engines. The air motor is keyed or splinted to the Bendix or starting mechanism and the engine is cranked in the same manner as an automobile engine is turned over when using the electric starter.

The starting motors are known as the Size 9BM and Size 20BM; the former having 9 hp and the latter 20 hp at 90 psi air pressure. They are small and compact, having an overall length of only 13 3/16 in. and 14½ in. The air motor is of the "Multi-Vane" type and the throttle valve is of the quick opening type to give peak horsepower almost immediately. A single step spur gearing is used to obtain suitable speeds.

### (3) Diesel electric plants

Two new lines of diesel electric plants, air-cooled and water-cooled, completely equipped and self-contained, have been developed by D. W. Onan and Sons, Inc.

The new Onan DSP air-cooled diesel engine is the prime-mover for the Onan Model 205DSP, 2500-watt diesel electric plant. Powered by this compact, one-cylinder, four-cycle engine, this new diesel power unit makes the economy of full diesel operation available to all users who must supply their own electric power. Its unusual compactness, (10½ cu ft) assures maximum adaptability to a wide range of portable or stationary jobs. The application of air-cooling to this diesel engine simplifies servicing and reduces maintenance costs.

The Model 205DSP is economical to operate; approximately 0.136 gal of fuel is required per kwhr at full rated load.

Onan air-cooled DSP diesel electric plants are available in alternating-current models of 2500 watt capacities, 60-cycle, and voltages of 115 or 230, single-phase, or 115/230-volt, single-phase, three-wire, or 230-volt, three-phase, three-wire.

Onan water-cooled diesel electric plants, in 10,000 to 35,000 watt capacities, are powered by heavy-duty Buda diesel engines. They are enclosed in weather-proof, sheet-steel housings with removable side-panels for easy servicing. The welded base is made of heavy structural steel.

The water-cooled models are available in capacities ranging from 10,000 to 35,000 watts, alternating current, in 60-cycles, single and three-phase, all standard voltages; also available in 50-cycle.

Direct current models of 10 kw and 15 kw are available in 115 or 230 volt.

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NAME..... TITLE.....

COMPANY NAME.....

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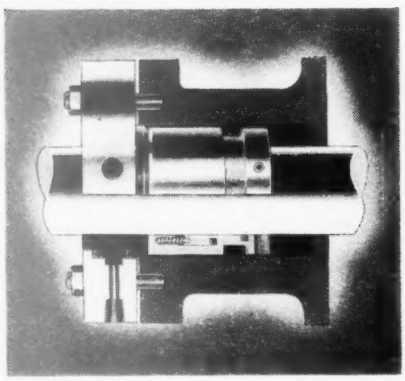
### (4) Mechanical seal

Durametallic Corporation, Kalamazoo, Michigan, announces a new high pressure, non-lubricated sealing for light hydrocarbons for pressures up to 600 psi. The new development, called Dura Seal Type P.S., is particularly designed for petro-chemical and pipe line service. One of its features is that it can be installed on practically any type of



pump, mixer, or other equipment that has a rotating shaft; or it can be specified as a component part of any new equipment that the user may order or build. No special sleeves are required and no special machining of the shaft is necessary. It can be used on either motor or turbine driven equipment.

### (5) Redesigned Aquatowers

The Marley Company, Inc., Kansas City 15, Kansas, is offering a complete line of redesigned Aquatowers to answer the demand for a "packaged product" up to 50 tons of refrigeration. Because the new Aquatower is so compact it is sent out completely assembled, which does away with expensive and uncertain field erection.

Features are:

All-steel integral welded casing with Marley nailless redwood filling.

Completely assembled ready for operation as soon as piping and electrical connections are made.

Two general styles and seven sizes ranging from 3 to 50 tons of refrigeration.

Engineered for indoor or outdoor service.

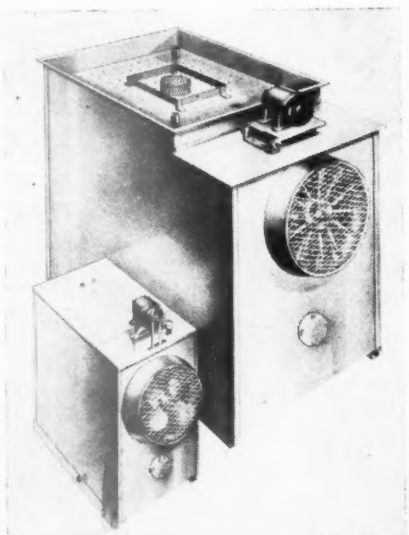
All components readily available for servicing.

Aluminum fans—all steel basins.

Immediate delivery — shipping from stock.

Sturdy fan guard insures safety.

Complete operation and maintenance instructions furnished.

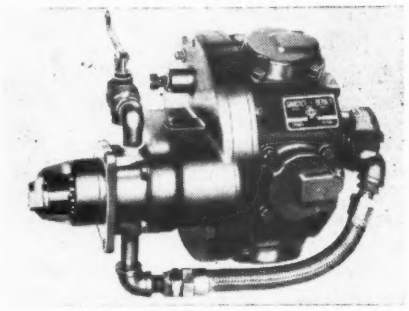


### (6) Air starters

A new line of air starters for gas, gasoline, or diesel engines—including five sizes, developing from 3 to 15 hp on 100 psi air pressure—has been announced by Gardner-Denver Company.

The principal features of these air starters, Gardner-Denver officials explain, are their extremely high torque and the elimination of costly battery maintenance and replacements. The high torque characteristic of the piston type motor, it is said, makes is especially desirable for diesel applications involving high starting loads, while the 5-cylinder radial design provides even torque through the operating cycle.

An exclusive Gardner-Denver feature is an air actuated starter pinion that, when the air valve is open, automatic-



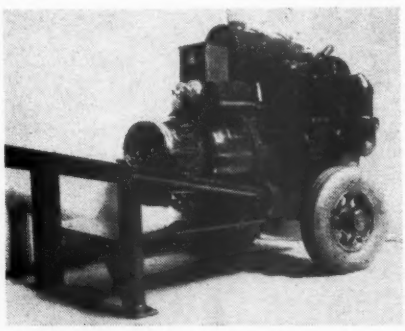
ally engages the ring gear a split second before the starter begins to crank the engine, thus assuring positive and safe engagement, it is stated.

### (7) Power plant

Contractors' mechanics can now use electric power for all types of construction work such as the operation of portable electric saws, drills, electric hammers, grinders, lamps, and other small tools.

The 2000-watt electric plant mounted on a two-wheeled hand truck, with detachable pipe handles, can be moved anywhere. Powered by a 4-hp air-cooled gasoline engine, it is economical to operate.

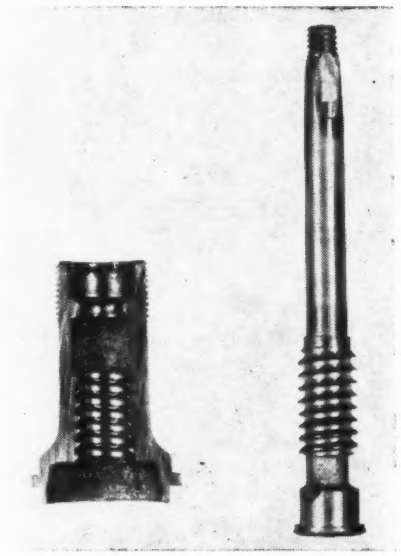
Manufacturer is Gaston Power Tools.



### (8) Stem material

Although previously used in millions of its bronze valves, the development of a new stem material has only recently been announced by The Lunkenheimer Company.

Patents have been granted on Lunkenheimer alloy (Symbols "RSB" and Alloy "6"), used in all Lunkenheimer valves with bronze stems. The manufac-



**Lunkenheimer Fig. 73 globe valve with steam bronze hub and cast silicon bronze stem. Stem still working well although partly worn after test that was stopped at 305,000 cycles.**

turer states that the new stem minimizes stem thread troubles, formerly a major cause of valve failures. Out of millions of Lunkenheimer valves equipped with these exclusive alloy stems, not one has been returned because of stem thread failure, it is asserted. In addition to its wear and abrasion resistance, the new stem alloy is said to resist corrosion and dezincification.

### (9) Vacuum gage dial

Helicoid Gage Division, American Chain and Cable Company, Inc., announces a new vacuum gage dial graduated 0 to 30 in. mercury vacuum in 0.2 of an inch increments, and with barometric pressure readings from 29 to 31 in. The zero on a vacuum gage is atmospheric pressure at sea level. Changes in atmospheric pressure will, therefore, affect the accuracy of the gage. The inaccuracy may be considerable if a vacuum gage is in a room pressurized by force draft. A difference of 1 in. in atmospheric pressure may cause a gage error of about 3½ per cent.

The new Helicoid vacuum gage may be corrected for changes in barometric pressure and thus assure more accurate readings. Such corrections are easily made by means of the external micrometer pointer adjuster.

The novel dial also reads counterclockwise to prevent any confusion with a pressure gage, and is designed with the subdivisions in steps for ease in reading to 0.2 in.

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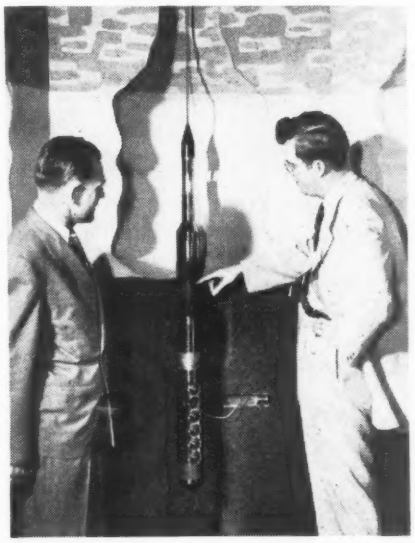
### (10) Side wall coring

A new tool, developed by the Halliburton Oil Well Cementing Company of Duncan, Oklahoma, makes it possible to take up to 30 side wall cores at one time, with good recovery. Core barrels are imbedded in the gun section, with



six barrels per section. Five of these sections may be run in tandem, making the 30 cores per trip possible.

In the accompanying photograph Wilfred Tapper, head of the Electrical Well Services Department of Halliburton, points to the self-potential well-logging ring incorporated in the tool, and explains its function to a visitor at the recent International Petroleum Exposition in Tulsa.

### (11) Fire extinguishers

American-LaFrance-Foamite Corporation of Elmira, New York, is announcing a complete new line of 2½-gal resistance welded silicon bronze fire extinguishers to replace riveted and copper fabricated units of the same capacity. They are soda-acid, foam, plain water, and antifreeze water types.

Each lighter in weight by 4½ lb, the manufacturer says they are much stronger because materials used have higher tensile strength, are more smartly styled, and are enhanced in appearance by the golden-hued color of the highly polished silicon bronze.

Additional features include resistance welded seams; welded hemispherical domes, tops and bottom; silver soldered elbow pads; projection welded hanger loop; new wider bottom handle; interchangeable caps, collars and gaskets; new spot welded name plates with identifying colors for each type unit; etc.

### (12) Scraper trap

Thornhill-Craver Company, manufacturers of Unibolt products, has introduced a new pipe line scraper trap.

According to the manufacturer, the new scraper trap is of hinged design that permits the operator to swing the scraper trap closure open or shut. The closure, or blanking plug, is so perfectly balanced on its hinge that it requires little effort for opening and closing.

Unibolt scraper trap employs the Unibolt design of tapered interlocking shelves between the nut member and the lug hub or blanking plug, which are drawn together by simply tightening a single bolt. (On the larger sizes from 6 in. up, two bolts are required). A resilient and replaceable gasket effects a leakproof seal when the bolts are tightened. The simplified design of the Unibolt scraper trap is becoming more popular because they may be opened and closed

quickly, without lifting heavy blind flanges off and on the line and breaking out and making up numerous bolts and nuts, and because there are no threads to leak after repeated opening of the trap, according to the manufacturer.

### (13) Hutchison calculator

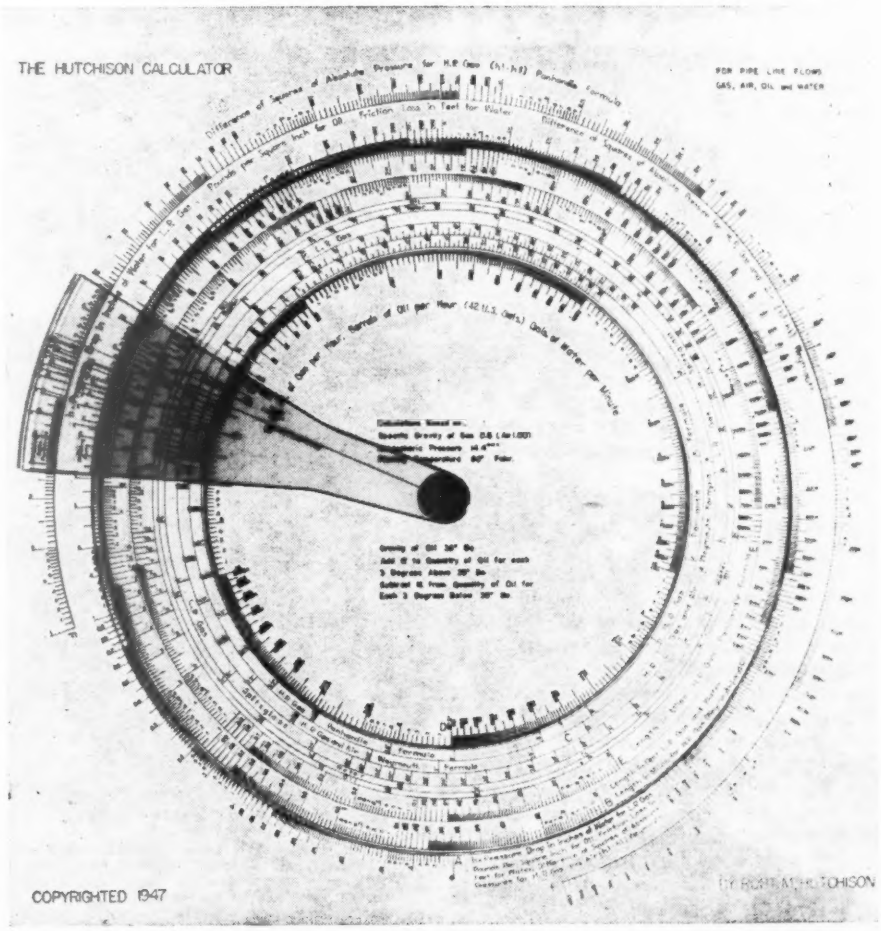
Robert M. Hutchison offers the Hutchison calculator, designed to solve all pipe line problems on one instrument.

According to Hutchison, the calculator will solve problems in:

1. High pressure gas pipe line flow by use of (a) the Panhandle Formula, and (b) the Weymouth Formula.
2. Low pressure gas pipe line flow by use of the Spitzglass Formula.
3. Simple oil flow by National Transit Formula.
4. Flow of water in pipe lines by use of the Spitzglass Formula.

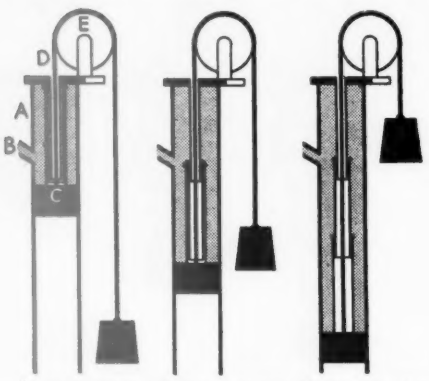
The calculator will correct for specific gravity of gas, for pressure base in gas problems, and for interval distribution in high or low pressure gas or water systems. It will also give hourly or daily results for gas and oil.

The calculator is printed on vinylite.



### (14) Hydra-line rig

An exhibit that caused plenty of excitement and comment at the IPE in Tulsa recently was M. O. Johnston's model rig, demonstrating the Mason hydra-line principle. This is a unique combination of a hydraulic cylinder and a clever telescoping assembly that provides one single, micro-sensitive control for all hoisting operations, and requires neither a traveling block nor drawworks. The hydra-line idea is completely revolutionary, and yet is so simple that even a child can understand it. Its possible


E
D
A
B
C
1 Load at rest with telescoping tube and piston assembly (C) in fully retracted position.
2 Fluid entering port (B) forces piston down to raise load. Note telescoping tubes.
3 Tubes extended and load at maximum height. Weight of load lifts piston when variable orifice is opened to bleed.

Schematic Hydra-line.

applications are many and diverse, and its fullest development is thus assured.

Tooling is now underway for the manufacture of Mason hydra-line rigs of capacities from 5 to 500 tons, with structures ranging from small portable servicing size to derricks 210 ft in height, and a maximum attainable drilling depth of 20,000 ft. A combination pumping and pulling unit will also be available. Full details of the Mason hydra-line units are expected to be released shortly.

### (15) Regulated carrier

Two new features have been made available as optional equipment for use with Lenkurt Type 32 Carrier Systems. The Type 32 System, providing three telephone carrier channels in the frequency range of 6 to 30 kc, can now be supplied with all-electronic pilot regulation and with a fourth carrier channel designed for order-wire service or transmission of nine f-m voice-frequency duplex telegraph channels.

The all-electronic pilot regulator results from a Lenkurt development program aimed at eliminating relays, motors, switches, and moving parts. The regulator is capable of correcting a 20-db variation in level within four seconds. It gives compensation continuously rather than in steps and twist correction is provided automatically as required. Operating level is indicated by a meter that also acts as a relay to provide alarm service when abnormal conditions arise.

Space for the added half channel has been obtained through a basic design improvement in filters. By making its own molded magnetic cores, the company has been able to steepen the sides of the filter response curves enough to permit insertion of nine duplex teletype channels in the previously unused spectrum between the physical circuit and the first carrier channel. Corresponding duplex space is made available at the high end of the carrier spectrum. New f-m telegraph units are available for this application. Because optimum performance of f-m telegraph equipment depends on operation at exact frequency, the new channel is carrier-synchronized by the pilot regulator for ideal operation conditions.

### (16) Rotary drawworks

The improved Brewster N-4 rotary drawworks, manufactured by The Brewster Company, has been designed to give maximum drilling efficiency in medium depth operations.

The N-4 is entirely air-controlled. Fawick air clutches and other controls are operated from a central panel at the driller's position. Unitized on a single skid, the N-4 is a compact drawworks, easy to move and rig up, it is stated.

A torque converter provides fluid cushioned power to handle any load with the ease and flexibility of steam. It automatically supplies top engine power with minimum engine effort, and protects the engine from overloads and stall loads.

The hydromatic brake provides smooth, even braking power for greater safety and speed in return trips.

The Brewster N-4 is recommended for drilling to 5500 ft with 4½-in. pipe with any 300-hp engine of popular make; 200-hp can be used for drilling to 4500 ft. A wire line reel with a capacity of 8500 ft of 9/16-in. line is avialable.

### (18) Block and hook

A new traveling block and hook combination has been announced by Regan Forge and Engineering Company. The traveling block is compact, narrow, and has a capacity of 200 tons. The hook is forged alloy steel with special adapter to traveling block that allows the hook to swing at right angle to traveling block, which eliminates rigidness.

This combination was designed with portable drilling units in mind, a saving of 4 ft in height having been effected.

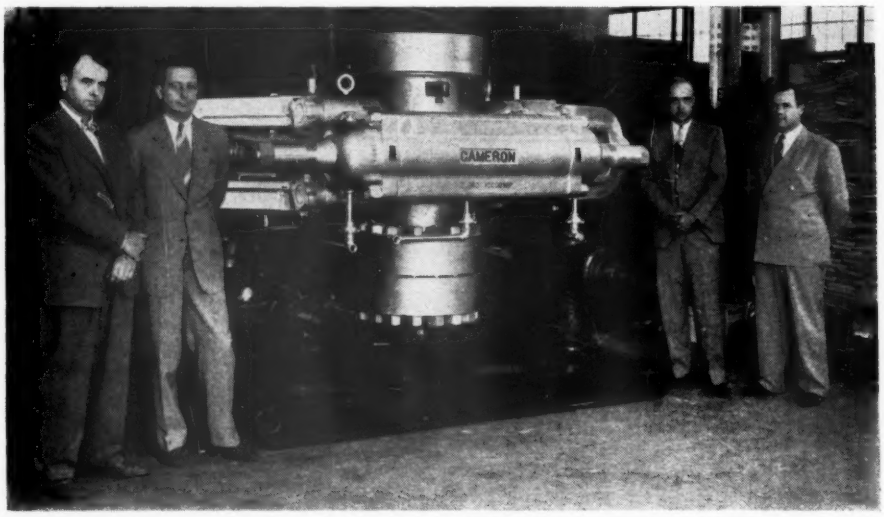
**Regan traveling block and hook combination.**

### (17) Blowout preventer

In keeping with the trend toward heavier equipment to handle the ever-increasing pressures encountered in modern deep drilling, Cameron Iron Works is now offering the Type "QRC" pressure-operated blowout preventer for 10,000 psi working pressure, 15,000 psi test pressure.

According to the manufacturer, the new high-pressure unit will be available only in 10-in. size for the time being.

The Cameron Type "QRC" model blowout preventer was introduced approximately three years ago and presented a number of mechanical features including: Quick ram change, high ratio of closing pressure to well pressure, compact, weight and space saving design, and 5000 psi working pressure models.




**Officials with the new 10,000-psi working pressure Type "QRC" pressure-operated blowout preventer at the conclusion of shop tests in which the unit was subjected to hydrostatic pressures exceeding 15,000 psi. Left to right: Herbert Allen, vice-president and works manager; Madden Works, chief engineer; Gene Long, plant superintendent, and Bob Farmer, assistant sales manager.**

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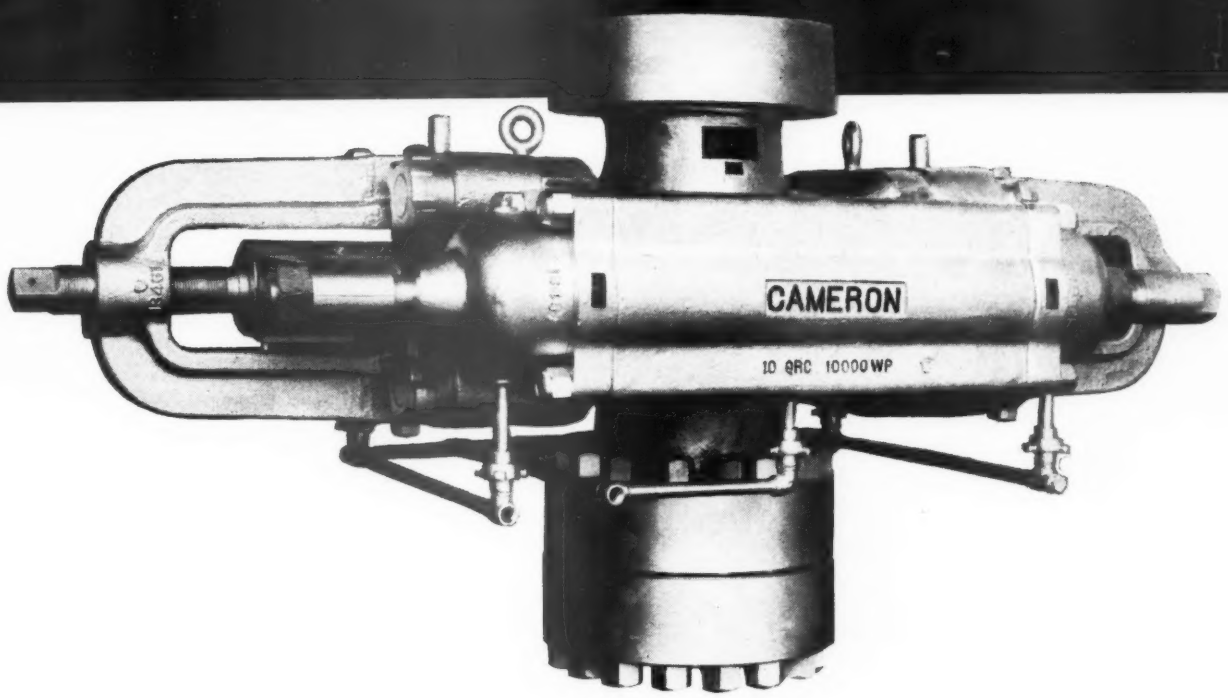



# TYPE "QRC" for 10,000 POUNDS W. P.

For more than a quarter century, Cameron has endeavored to anticipate and provide for the needs of the industry. This policy has resulted in the addition of many new units to the Cameron line and constant improvement of established Cameron products.

A case in point is the Cameron Type "QRC" Pressure Operated Blowout Preventer. When this radically new drilling control unit was announced approximately three years ago, the line included 10,000 lbs. test, 5,000 lbs. working pressure, models up to and including 10" size . . . the first 10,000 lbs. test pressure-operated blowout preventers manufactured by Cameron.

As drilling depths have continued to increase, and well pressures have risen steadily, Cameron engineers have been alert to the eventual need for blowout preventers to safely handle even greater pressures.

Those blowout preventers are available today!

The first of these big, rugged units has been assembled, successfully tested and displayed at the International Petroleum Exhibit. It is a 10 in. size, Type "QRC", Pressure-Operated Model which weighs approximately 15,000 lbs. It is the blowout preventer that is destined to save many a deep, costly well bore of the future.

## CAMERON IRON WORKS, INC.

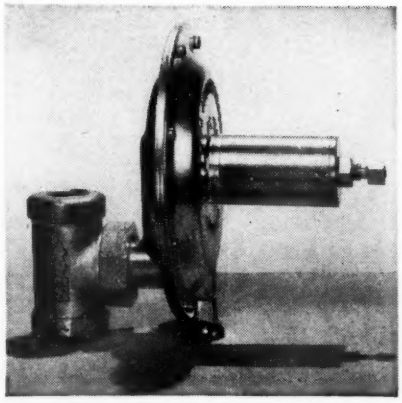
P. O. BOX 1212, HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y. Oklahoma: 310 Thompson Bldg., Tulsa (Telephone 28970). California: Long Beach (P. O. Box 267). Wyoming: 356 N. Wolcott St., Casper. North Louisiana: Bossier City (P. O. Box 425). Texas: Midland (Telephone 1982), Corpus Christi (Telephone 28783), Ft. Worth (Telephone 46522).

### (19) Gas pressure regulators

Universal gas or air regulators for reduced pressure in pounds is suitable for any inlet pressure up to a maximum of 250 psi, and is built in ¾-in, 1-in, and 1¼-in. pipe sizes. Type No. 47-MP provides a reduced pressure range of 2 to 12 psi. The reduced pressure range of Type No. 47-HP is 5 to 25 psi. The regulators are especially recommended for pressure reduction at farm taps on gas transmission lines, and also are used with gas-fired, oil and gas heaters, oil emulsion treaters, and in other similar services. Many applications are in shops or industrial plants where air or gas pressure must be reduced for heat treating furnaces, laboratory apparatus, air tools, etc., according to the manufacturer, Universal Controls Corporation.

Construction is rugged throughout with diaphragm casings of heavy gauge stamped steel. Steel is cadmium plated inside and out to resist corrosion. Exclusive feature is location of diaphragm in a vertical plane with breather vent and drain at lowest point to drain all moisture from air side of diaphragm. A union joint between regulator body and casing permits placing the body either in a horizontal or vertical pipe line without disturbing the drainage feature. Adjustment for desired pressure is made by turning the set screw. Lock nut provides means for fixing the setting, once the regulator is adjusted. Other features are stainless steel valve stem, oil-resistant synthetic rubber diaphragm and valve seat disk. Close regulation and ample capacity are important characteristics of this regulator, it is asserted.

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HAS MANY MONEY-SAVING CORRECTIVE MEASURES

SOUR CRUDE CORROSION

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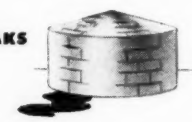
EVAPORATION LOSSES

• NATASCO PLASTIC TANK CEMENT
Seals at seams, eaves, around fittings.

BOTTOM LEAKS



• NATASCO PLASTIC TANK BOTTOM CEMENT
Seals leaks and prevents corrosion.

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• NATASCO INSIDE SHELL CEMENT
Prevents corrosion in the vapor space.

Whatever your tankage maintenance problem, it will pay you to check into it with NATASCO. Advisory service is yours for the asking. Get all the particulars on NATASCO contract service—many tank owners prefer to let the NATASCO APPLICATION CREW do the whole job. If you have a tank protection problem, get in touch with NATASCO, now.

*"Keeps new tanks new—Makes old ones do"*

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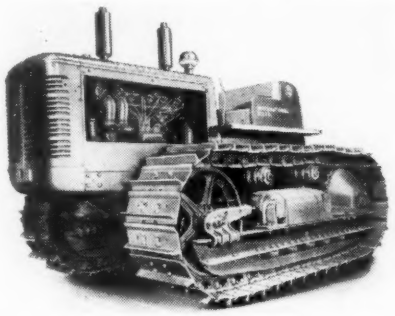
NH-3


### (20) Diesel tractor

Increased horsepower ratings for the 6-cylinder International TD-18 diesel crawler tractor have been announced by the industrial Power Division of International Harvester Company. At 1300 rpm, the TD-18 now develops 97 hp at the flywheel, 1.5 belt hp, and 80.5 drawbar hp.

Design of the cylinder heads provides better cylinder head cooling, it is asserted. Intake and exhaust manifolds are mounted on opposite sides of the engine. This arrangement provides a direct flow of intake air and exhaust gases, thereby improving engine breathing efficiency. With manifolds separated, the volumetric efficiency of the intake air is increased. When intake air is not preheated by the exhaust manifold, it retains its maximum atmospheric density while being drawn into the cylinders.

The new International fuel injection



system delivers accurately metered, equal quantities of fuel to each cylinder in accordance with the needs of the engine. The injection pump has two plungers, each serving three cylinders, as against one for each cylinder in other pumps. These plungers may be easily and economically replaced. The injection nozzles are single-orifice type set, with precombustion chambers, into the cylinder head at an angle that promotes complete combustion of low-cost fuels.

The injection pump has a quick-acting, variable-speed governor with torque control. When the engine is pulled down by overload, the torque control causes fuel to be injected into the cylinders, thereby increasing the engine's lugging ability to get through tough spots.

### (21) Electronic weight indicator

The Byron Jackson Oil Tool Division recently announced the availability of a new electronic weight indicator, model 500A, designed for measurement of any operation in which the tension load does not exceed 75 tons nor the compression load exceed 150 tons. Recommended for controlled setting of cement retainer, bridging plugs, fishing operation, etc., by rig operators or service crews.

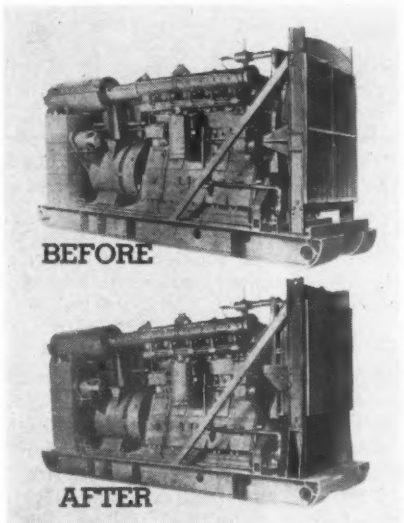
The new weight indicator operates on the null balance principle and translates electrical impulses from the connecting sub into precise weight readings. Provides coarse and fine adjustments of instrument balance. Subs are equipped with electronic strain gages and compensated for internal pressure effect.

The BJ weight indicator is available in the model 500A only, subs can be supplied in any size on special order. Standard sub is a 2½-in. double-box 8-thread round external upset unit.

This new indicator is rugged and of simple design. There's no need to baby either the connecting sub or the indicating instrument. All leads on the sub are fully protected by a heavy, vulcanized sleeve of tough rubber. The working parts of the indicating instrument are within 2 per cent of the full-scale load. Temperature changes have no effect on the accuracy of the readings. There are no changes in readings due to variations of fluid pressure within the sub.

### (22) Engine cooling

A new application for diesel engine cooling is announced by the Young Radiator Company. It concerns an installation of a welded steel "Mono-weld" unit developed by Young. In the "before" picture is shown the oversize cast tank, sectional radiator originally supplied for




use on large diesel-electric generating units. Nine individual core sections make the cooling unit large and bulky.

In the other photograph is shown the new Young "Mono-weld" welded steel tank and side-member radiator installed on the same generator. A one-piece core construction makes possible a lighter, more compact, more efficient unit. Sturdy construction, plus uniformity of tank material, means a low priced unit having the ability to withstand extreme shock loads without failure, it is pointed out.

The "Mono-weld" unit, illustrated in the "after" view, is one of a complete line of Young units ranging in size from 2-ft square up to 10½-ft square.

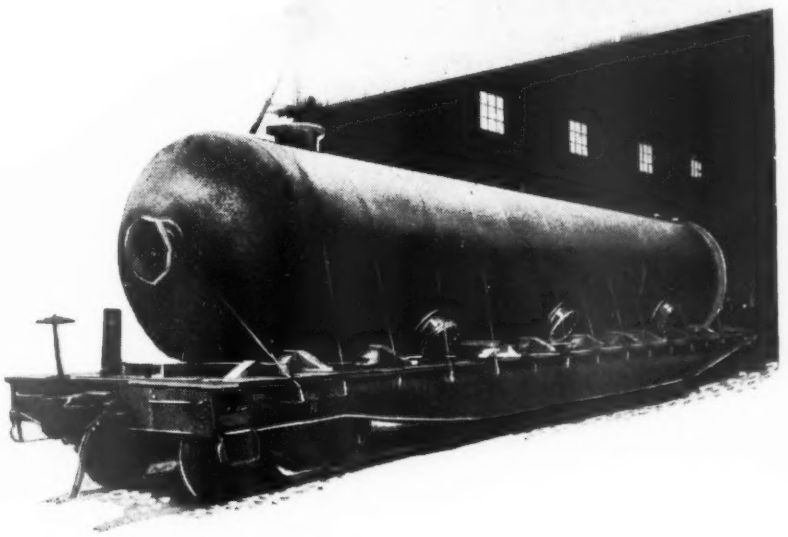
### (23) Slush pump valve

A fitting companion for the Mission Manufacturing Company Silver Top Valve, proved outstanding for ordinary service, is the new Mission "Super-Service" slush pump valve, made especially for use where pressures are extremely high. The valve seat is constructed with four deep-section cross-arms to distribute the load evenly throughout the seat. Large, file-hard striking surfaces minimize wear and a 35 per cent longer valve stem guide reduces valve "wobble." As with the Mission Silver Top Valve, the new "Super Service" valve has compound-308 inserts, which users report give long life and good service.

**Mission Super-Service valves for extremely high pump pressures.**

PRESSURE VESSELS

- Towers
- Absorbers
- Scrubbers
- Drums
- Pressure Storage
- Processing Equipment



OUR SHOP FACILITIES INCLUDE:

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- ROLLS CAPABLE OF ROLLING 1½" Steel to 3' Diameter in 10' RINGS.
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# trade literature

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### (24) Sucker rod hook; elevator

A recent pamphlet issue by J. P. Ratigan, Inc., announces two items of special interest to production men. The first is its No. 183 sucker rod hook, an extra-heavy spring type unit, weighing 85 lb, with a capacity of 60 tons. It can be lifted or pulled down by one man. Another important feature is that if the operator should allow too much slack when he sets back on the elevator, the spring in the hook takes it up, and holds the stand straight. The second item described is the No. 218 tubing elevator, a single bail job that can be used on either side. Designed for faster, easier work, especially when used with gin poles or Blitz rigs, it operates with all the speed and smoothness of a rod elevator. It has been tested to 200,000 lb and can be supplied to take either 2, 2½, or 3-in. tubing.

### (25) Pipe line supplies

Perrault Brothers, Inc., 1130 North Boston, Tulsa, Oklahoma, has issued a new catalog covering its line of pipe line equipment and supplies. Included are cleaning and priming machines, glass pipe wrap, pipe bending machines, coating and wrapping machines, heating kettles, trencher and hoe teeth, and general pipe line supplies of every description. An outstanding item is the coating and wrapping machine that will: (1) Apply one coat of bitumen (2/32 to 4/32 in. thick), and one wrap of standard pipe line wrapper of one layer thickness using two rolls; or, (2) apply one coat of bitumen, one wrap of standard pipe line wrapper (such as glass) of one layer thickness, and a second wrap of standard wrapper applied on top of the first wrap by use of an extended arm.

Another feature of the catalog is a set of tables that gives data on the amounts of felt wrapper required for various diameter pipe, and approximate quantities of primer paint and enamel coating.

### (26) Oil burners

Peabody Engineering Corporation, New York, New York, now has available two new bulletins on oil burning equipment. Bulletin No. 111 describes Peabody Type "A" and Type "H" oil burners with the wide-range mechanical atomizing feature and the second, Bulletin No. 205, describes the Peabody combination gas and oil burners. Both bulletins carry cross-section blueprint drawings of both types of burners and Types "A" and "AB" wide-range mechanical atomizers.

### (27) Corrosion bulletin

Causes and control of contamination in the petroleum industry are thoroughly covered in two new Amercoat descriptive bulletins. One covers "Production and Drilling," the other "Refining". Complete, factual, concise data is given on more than 60 difficult exposures and definite recommendations made for each. How to prevent corrosion of drill stems, sucker rods, pumps, tubing, casing, and perco sweetening systems, acid sludge tanks, buildings, and dozens of other surfaces are thoroughly described. All recommendations are made on the basis of actual experience beyond the laboratory and are supported by convincing evidence before included in the bulletins. American Pipe and Construction Company, is the manufacturer.

### (28) Pumps, turbines, packing

Worthington Pump and Machinery Corporation, Harrison, New Jersey, has released four new bulletins. Bulletin W-305-B1 describes Types CN and CNE centrifugal pumps for use in services involving hot and cold water, brine, process liquors, light oils, and similar liquids. These are ball bearing equipped single-stage units. Bulletin 1961 describes the Type "S" multistage steam turbine with oil relay governor. Bulletin W-341-B13 has as its subject Type G mechanical seals built into Worthington centrifugal pumps for petroleum products. Bulletin W-404-B3 describes Worthington cup type piston packing.

### (29) Magnet sub-assemblies

A concise 4-page illustrated booklet (No. CDM-16) devoted to a description of G-E permanent magnet sub-assemblies, has been issued by the General Electric Company's Metallurgy Division, Pittsfield, Massachusetts. The booklet describes how these magnetic sub-assemblies eliminate assembly line rejects, the high cost of test equipment, breaking and chipping losses, and the expense of shipping semi-finished magnets. Among the sub-assemblies illustrated are the magnetic focusing sub-assembly, the Titan valve sub-assembly, the magnetron sub-assembly, the cable clamp sub-assembly, a radar jammer tube, and a snap action switch.

### (30) Roller chain chart

The Baldwin-Duckworth Division of Chain Belt Company has published a roller chain identification wall chart for use by drilling rig operators. The chart was first distributed at the recent International Petroleum Exposition at Tulsa.

The chart has full-size scale drawings of Baldwin-Rex standard and heavy series single strand and multiple width roller chains. By holding a link or section of roller chain against the chart, or by measurements, its exact size can be readily determined and ordering made considerably easier.

### (31) Gearmotors

A new 16-page illustrated catalog, Book No. 1815, has been published by Link-Belt Company, 307 North Michigan Avenue, Chicago 1, Illinois, covering double and triple reduction units with integrally mounted electric motor, in standard sizes of 1 to 30 hp with an output speed range of 280 to 6 rpm.

Link-Belt motors made according to NEMA specifications are used. Motors may be open, totally enclosed, splash- or explosion-proof, and supplied with special grades of insulation. Motor-operated brakes also can be supplied.

The new catalog tabulates the various sizes of gearmotors available; gives dimensions, and average weights; shows styles of mountings; includes load-classification and selection tables; and gives dimensions of slide rails.

### (32) Well pressure indicator

A 4-page, 2-color, illustrated brochure explaining the operation and benefits of the new McCullough supersensitive surface recording well pressure indicator has been published. Typical charts of wet and dry tests are shown and the complete sequence of operation from start of test to final results are completely described. Benefits to the oil operator are stressed including permanent installations, which make possible a continuous record of bottom hole pressures.

### (33) Diesel drilling engine

Superior PTD diesel drilling engines, including engines with dual fuel equipment, are described and illustrated in a new 20-page bulletin, No. 318-A. These are naturally-aspirated 6- and 8-cylinder engines with 8½-in. bore and 10½-in. stroke, rated at 300 and 400 hp, respectively, at 900 rpm for continuous operation. Both power and speed are greater than specified in the superseded bulletin.

Bulletin 318-A describes the main components of the engine and illustrates construction features. It includes new material and pictures of the engine with dual fuel equipment, new performance charts and specifications.

### (34) Development portrayed

Using the excellent works of Frank Chapman Williams, eminent artist, The Baroid Sales Division of National Lead Company, Los Angeles 54, California, is combining advertising and education in an unusually colorful and effective manner. This program involves the reproduction of Williams' originals, specifically executed for Baroid, and portraying significent events in the evolution of petroleum equipment and technique. Opening the series is an interesting scene depicting a drilling rig in operation in China more than 2000 years ago. Such rigs, then employed in the drilling of brine wells, are said to have sometimes reached a depth of 2000 ft, and they incorporated many of the basic features of the present cable-tool outfits. In any case this type of visual exposition should prove very popular, and will no doubt be followed with extreme interest by students of petroleum history, and by producers of petroleum—who are not infrequently one and the same person.

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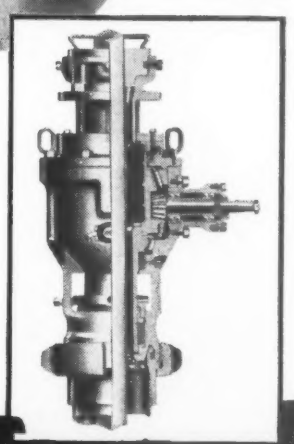
# REVERSE CIRCULATION

## USE THE GUIBERSON "H" DRILLING HEAD

By using the Guiberson Type "H" Combination Drilling Head and Rotary Table with reverse circulation, cuttings are brought to the surface faster, permitting classifying formation and drilling depth quickly and accurately. Returns, when circulating in either direction, are kept under positive control. In drilling float collars, cement plugs or new hole, the Guiberson Type "H" Drilling Head performs with unbelievable speed.

The Type "H" Drilling Head with its positive shutoff against high or low pressures is ideal for completing wells under controlled pressure, for work-overs, slim hole drilling and cleanout work. Drilling Head and Rotary Hose are easily manifolded for circulating in either direction.

The Type "H" Drilling Head serves as a smooth running high speed rotary table. Kelly and packing rubber are rotated together by kelly bushing and core which are revolved by a built-in shaft. Power is usually delivered through universal joint or flexible coupling from gas or diesel engine, electric motor or draw works shaft.



The accordion shaped packing rubber provides a positive seal around any standard square, hexagon or octagon kelly, as well as tubing. Available in three different sizes to pack off around 2", 2½" or 3" tubing. Also, rubbers for small sizes of tubing can be furnished.

*For full information concerning the various types of Guiberson Drilling Heads, see Pages 1519-1524 of the 1948 Composite Catalog or write to*

BETTER BE SAFE THAN SORRY GUIBERSON

### (35) Removable side door chokes

Removable side door chokes for the completion and production of single and two zone wells is the subject of a bulletin issued by Otis Pressure Control, Inc., Dallas, Texas. The primary purpose of the bulletin is to offer a concise coverage of all standard applications of this equipment, and to illustrate the simplicity with which the various applications can be accomplished. The description is detailed and color drawings graphically illustrate the text.

### (36) Packing chart

United States Rubber Company has published a new chart for refineries and gasoline plants listing the types of packing recommended for various types of service. The chart lists packings for use in connection with acid, ammonia, brine, caustic, oil distillates, hot oil, propane and butane, hot water, and cold water.

### (37) Cooling units

The new line of giant-sized "VAD" (Vertical Air Discharge) cooling units recently introduced by Young Radiator Company of Racine, Wisconsin, excited considerable interest from industry. Now Young has released a special catalog on the "VAD" units that should prove particularly informative to those whose cooling and condensing requirements are large.

### (38) Filters and their applications

Dollinger Corporation, 11 Centre Park, Rochester 3, New York, has issued a catalog on its line of filters, which are marketed under the trade name Staynew. The company manufactures filters for every purpose. The catalog illustrates and describes the complete line.

### (39) Short connector

New 2-page bulletin No. O. T. 48-3-3M presented by the Oil Tool Division of Byron Jackson Co. stresses the advantages of a short connector for portable and mast-type drilling and production rigs. The new BJ 475 "Stubby" connector is only 22½ in. from shank pin to link ears.

### (40) Pump data sheet

New Aldrich Data Sheet has 62 pictures and describes various types and sizes of high pressure pumps designed and built for pipe line, oil field, and refinery service. Contents of this booklet include sections on the Aldrich-Groff "Powr-Savr" controllable capacity pump, Triplex, and Quintuplex pumps, and the most recent additions to the line, Septuplex and Nonuplex pumps.

### (41) Bronze and alloys

A condensed catalog called Bulletin 95 has been issued by Ampco Metal, Inc., Milwaukee, Wisconsin, producers of Ampco Metal and bronze products. This 16-page bulletin covers the Ampco line and its bronze products and alloys.

Besides various alloys the product range covers bronze rod and sheet, non-sparking safety tools, resistance and arc welding electrodes, corrosion-resistant centrifugal pumps, plug valves, and fabricated assemblies.

### (42) Duplex pump

A new 16-page bulletin, No. 324, describes and illustrates the Ideal Type D-50 Duplex power driven pump manufactured by The National Supply Company, P. O. Box 899A, Toledo, Ohio. This pump has a 5-in. bore and 10-in. stroke, a rated output range of from 50 to 62 hp and will discharge up to 245 gpm at 440 psi or, with a 3½-in. diam liner, up to 110 gpm at 945 psi. Principal applications are slush pumping, oil gathering, and water supply service.

### (43) Jet gun bulletin

A new bulletin describing the Jet Shot has been released by Perforating Guns Company, Houston, Texas, with offices in Carthage, Beeville, Odessa, Lake Charles, Brookhaven, Mississippi, and El Dorado, Arkansas.

### (44) How to stop leaks

A free copy of the Stonhard folder, "You Can Stop Leaks Instantly," gives complete information how to seal water-seepage or leaks in practically every type of masonry construction. The booklet is released by Stonhard Company, Philadelphia.

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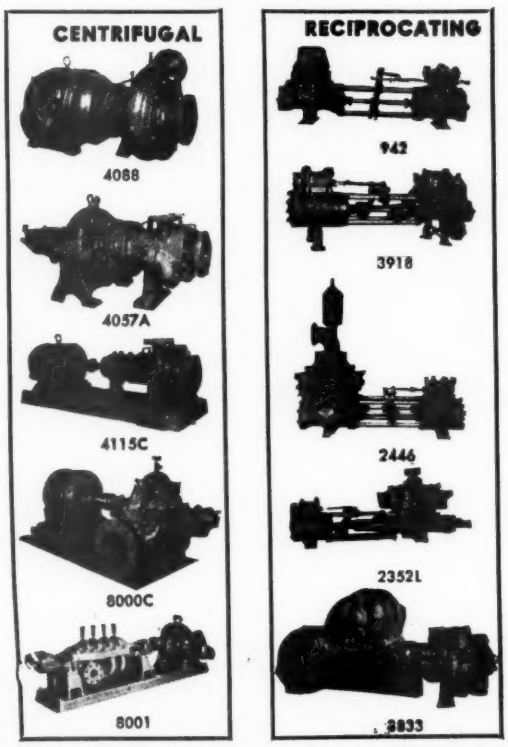


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# CONTINUOUS TABLES

a daily reference for operating men

## INSTALLMENT No. 133

A valuable and regular feature of *The Petroleum Engineer*, the Continuous Tables, now in their twelfth year of publication, were designed to save time and effort for the technician and the practical field or plant worker. The tables have proved one of the most popular and helpful departments of *The Petroleum Engineer*. Data are presented in the simplest form available with many types of information included that are best presented by curves or nomographs when three or more variables must be considered simultaneously.

The Continuous Tables have been developed as a result of suggestions for new tables, direct contributions and improvements to existing tables by members of the petroleum and related industries, including manufacturing concerns, who are continually searching for practical information reduced by computation to tabular form readily applicable to the problems daily confronting them that might otherwise necessitate a more or less tedious calculation. These contributions and suggestions from the industry have resulted in a valuable exchange of information and data contributing to the progress of the industry as a whole.

This index will be revised monthly. The index for installments 1-12, inclusive, will be found in the May, 1938, issue; 13-24, inclusive, in the June, 1939, issue; 25-36, inclusive, in the June, 1940, issue; 37-48, inclusive, in the June, 1941, issue; 48-60, inclusive, in the June, 1942, issue; 61-72, inclusive, in the June, 1943, issue; 73-79, inclusive, in the January, 1944, issue; 80-82, inclusive, in the April, 1944 issue; 83-85, inclusive, in the July, 1944, issue; 86-88, inclusive, in the October, 1944, issue; 89-91, inclusive, in the January, 1945, issue; 92-94, inclusive, in the April, 1945, issue; 95-97, inclusive, in the July, 1945, issue; 98-100, inclusive, in the October, 1945, issue; 101-103, inclusive, in the January, 1946, issue; 104-106, inclusive, in the April, 1946, issue; 107-109, inclusive, in the July, 1946, issue; 110-112, inclusive, in the October, 1946, issue; 113-115, inclusive, in the January, 1947, issue; 116-118, inclusive, in the April, 1947, issue; 119-121, inclusive, in the July, 1947, issue; 122-124, inclusive, in the October, 1947, issue; 125-127, inclusive, in the January, 1948, issue; 128-130, inclusive, in the April, 1948, issue.

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# HYATT ROLLER BEARINGS

# PROPERTIES OF INTERMEDIATE ALLOY STEELS AT ELEVATED TEMPERATURES

The average tensile, creep, and rupture strengths of these steels at elevated temperatures are shown in Tables 1 to 10. It will be seen from the tensile strength curve, Fig. 1, which covers the entire range from room temperature to 1400 F, that there is little or no decrease of strength from room temperature to 600 to 700 F. Indeed, in the carbon and molybdenum steels, the tensile strength actually increases with increase of temperature from room temperature to 400 to 600 F (the blue brittle range). It is noteworthy that this increase of strength is not apparent in the chromium-bearing steels. Above 700 F, where softening or creep first appears in steel, the strength decreases rapidly, and design of structures to operate above this temperature must be based on creep and rupture strength instead of yield and tensile strength.

Examination of the average creep and rupture curves, Figs. 2 and 3, discloses that the strength of carbon steel is greatly increased by the addition of molybdenum. Below 1000 F, addition of chromium to molybdenum-bearing steel does not generally cause further improvement in strength. Above 1000 F chromium and silicon additions cause some improvement in creep and rupture strength, probably because these elements improve the scaling or corrosion resistance.

Tests have shown that the scaling resistance of carbon steel is not markedly altered by the addition of molybdenum. Small amounts of chromium cause some improvement, whereas increase of the silicon content in the chromium-molybdenum steels to 1.25 or 1.50 per cent causes a large increase in scaling resistance. Scaling tests in steam have shown, however, that silicon does not improve scaling resistance as much as in air. Experience with oil refinery cracking still tubes indicates that chromium contributes somewhat more to corrosion resistance than was found in the scaling tests in air.

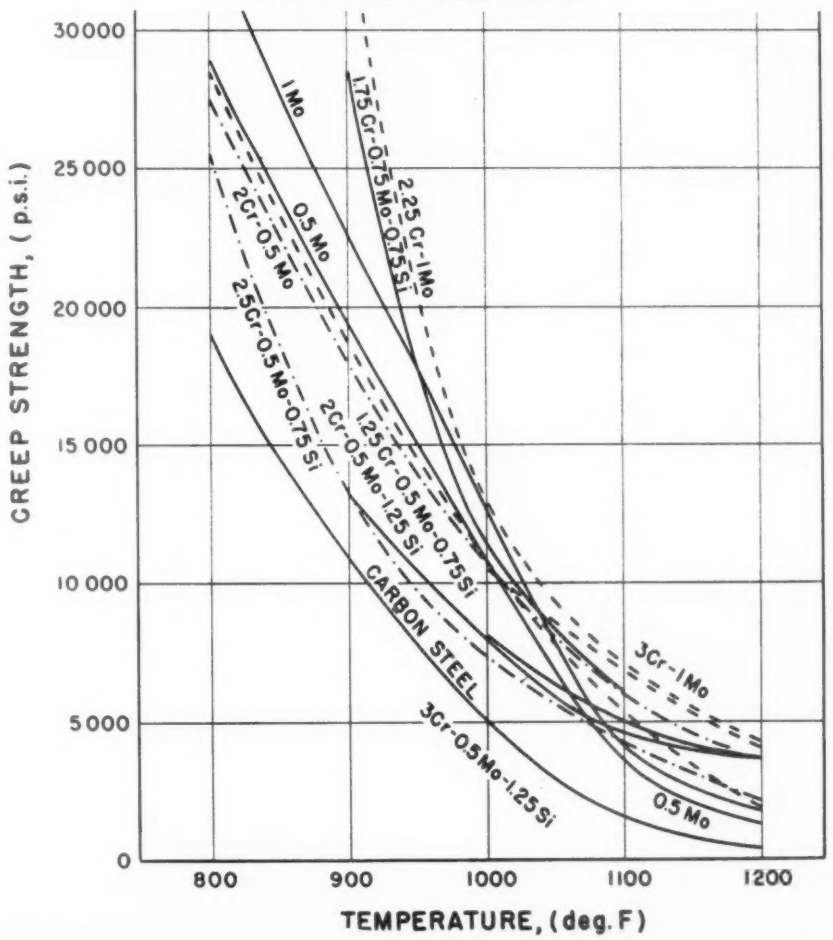
**TABLE 7. 2.5 per cent Cr, 0.75 per cent Si, 0.5 per cent Mo—properties at elevated temperatures*. Composition range covered by specifications (per cent).**

| C | Mn | Si | P | S | Cr | Mo |
|---|---|---|---|---|---|---|
| 0.15 max | 0.50 max | 0.50/1.0 | 0.030 max | 0.030 max | 2.25/2.75 | 0.45/0.65 |

| Property | Temperature, F | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 |
| ASME Maximum allowable stress (1000 psi) | | | | | | | | |
| Tensile strength (1000 psi) | 65 | 60.5 | 55 | 47.5 | 38 | 29 | 19 | 12.5 |
| Yield strength (1000 psi) | | 26 | 24.5 | 22.5 | 20 | 16 | 11.5 | 7.5 |
| Elongation (per cent in 2 in.) | | 33 | 39 | 43 | 50 | 60 | 70 | 75 |
| Reduction of area (per cent) | | 69.5 | 75 | 80 | 86 | 90 | 93 | 96 |
| Creep strength 1 per cent in 10,000 hr (1000 psi) | | 26.5 | 15.0 | 9.0 | 5.0 | 2.1 | 1.5 | |
| Creep strength 1 per cent in 100,000 hr | | 21.0 | 11 | 5.5 | 2.7 | 0.8 | | |
| Repture strength 1000 hr—(1000 psi) | | | | | | | | |
| Rupture strength 10,000 hr—(1000 psi) | | | | | | | | |
| Oxidation (weight loss in grams per sq in. after 168 hr in air at the indicated temperatures) | nil | nil | nil | 0.03 | 0.05 | 0.20 | 0.46 | 0.90 |
| Linear thermal expansion (inches per foot—from 70 F to the indicated temperatures) | | 0.066 | | 0.087 | | 0.110 | | |

*Limited data available.

**FIG. 2. Creep strength curves.**




NOTE: References are shown on the last sheet in this series of tables.

Taken from the exclusive article, "Intermediate alloy steels at elevated temperatures," by R. F. Miller, Research and Technology Division of Carnegie-Illinois Steel Corporation, published in *The Petroleum Engineer*, January, 1948, pages 178 to 189, inclusive.

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# A METHOD OF DETECTING AND REPAIRING LEAKS IN WELL CASING

In the Texas Panhandle, as well as in other sections of the country, production strings of casing are subject to electrical action from ground currents. Because of this action, or electrolysis, holes appear in the casing strings, usually within the top 300 ft, permitting gas to escape to the top soil and kill vegetation. This not only causes a loss of gas, but damages crops and grazing land, which damage must be paid for by the gas producer.

Heretofore, the repair of casing leaks was an expensive operation, requiring a full new production string of casing of smaller diameter than the existing production string. Due to the ingenuity of Charles I. Galloup of Texoma Natural Gas Company, however, the location and repair of casing leaks now are operations that are comparatively simple and inexpensive. The cost of repair has probably been reduced 75 per cent.

Galloup has invented a device that he calls a "casing leak detector." The device is quite simple, consisting of a metal cylinder approximately 16 in. long with wire mesh formed as a cylinder and attached to lower end of the metal tube, over which is placed a skirt of fabric that is held in place by a rubber band. In the upper end of this metal tube is a bail, to which is attached a Halliburton measuring line. It is lowered into the well by means of a Halliburton measuring device, after well pressure has been equalized; or, to use a gas field expression, "it is lubricated into the hole".

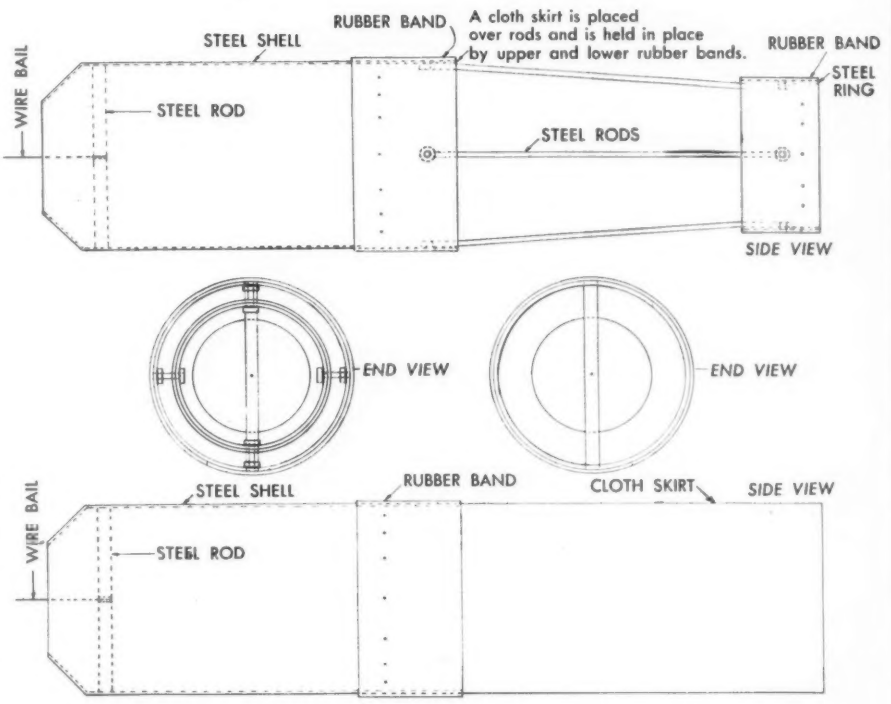
When the casing leak detector reaches the casing leak, the pressure differential at the leak pulls the fabric skirt into the hole in the casing through which gas is escaping and stops the descent of the detector. The depth of the leak is then noted and the detector is retrieved, leaving the skirt at the leak. This not only locates the leak, but temporarily stops the leak until repair work gets under way.

The accompanying sketch of this device shows its simplicity and effectiveness. The wire mesh is not shown in the sketch, but it is under the skirt, and is the length of the skirt.

After the leak is found, a short string of pipe with a packer is run, and when the packer is set the leak is sealed. The packer is set 100 ft below the leak, and the pipe extends about 20 ft below the packer to insure stability.

With this type of repair it will be obvious that a great saving will be made in steel; one of the items that is now in short supply. Instead of using, say 2400 ft of 7-in. casing in an 8-in. well, a short string of 300 or 400 ft is used with a packer. The saving in steel is from 83⅓ to 87½ per cent and it is important that steel be used as sparingly as possible at this time.

**Top is multiple leak detector for gas wells and at bottom is single leak detector.**




Galloup is superintendent of drilling operations, and he has had better than 35 years' experience in oil and gas fields, most of those years being with the Cities Service Company and Texoma Natural Gas Company in a supervisory position; the last 17 years being with the latter company.

Leaks have recently been discovered in some of our wells, and they have been repaired in the manner described herein. The results have been quite satisfactory. Galloup advises that, although this detector has been used only in gas wells thus far, it will work equally well in an oil well.

Much interest has developed in this casing leak detector, and Galloup has been consulted by other companies that have leaking wells, with a view toward using his detector to locate these leaks. It is my opinion that all producers should know of this device, as a matter of economy.

● **Detection of leaks in river crossings.** Where multiple lines are used for a river crossing, it is difficult to ascertain, in the case of a leak in the pipe embedded in the river bank, which of the lines is leaking. To be able to establish definitely the location of the leak without great expense would be advantageous to a pipe line company. At the present time, it is a matter of digging out lines until the leak is found, which involves great expense. The casing leak detector can be used to locate such a leak in a river crossing. The procedure would be as follows:

Start with Line No. 1. Set up measuring device. Attach a plug to the end of the measuring line and send this plug through Line No. 1. Detach the plug, attach the casing leak detector, and pull the detector back through Line No. 1. If the leak is in this line, the detector will be stopped at the leak and the location can be noted. If the leak is not in this line, repeat the operation with Line No. 2, and so on.

---

Taken from the exclusive article entitled "Detection and repair of casing leaks," by William F. Martin, Texoma Natural Gas Co., published in *The Petroleum Engineer*, January, 1948, page 103.

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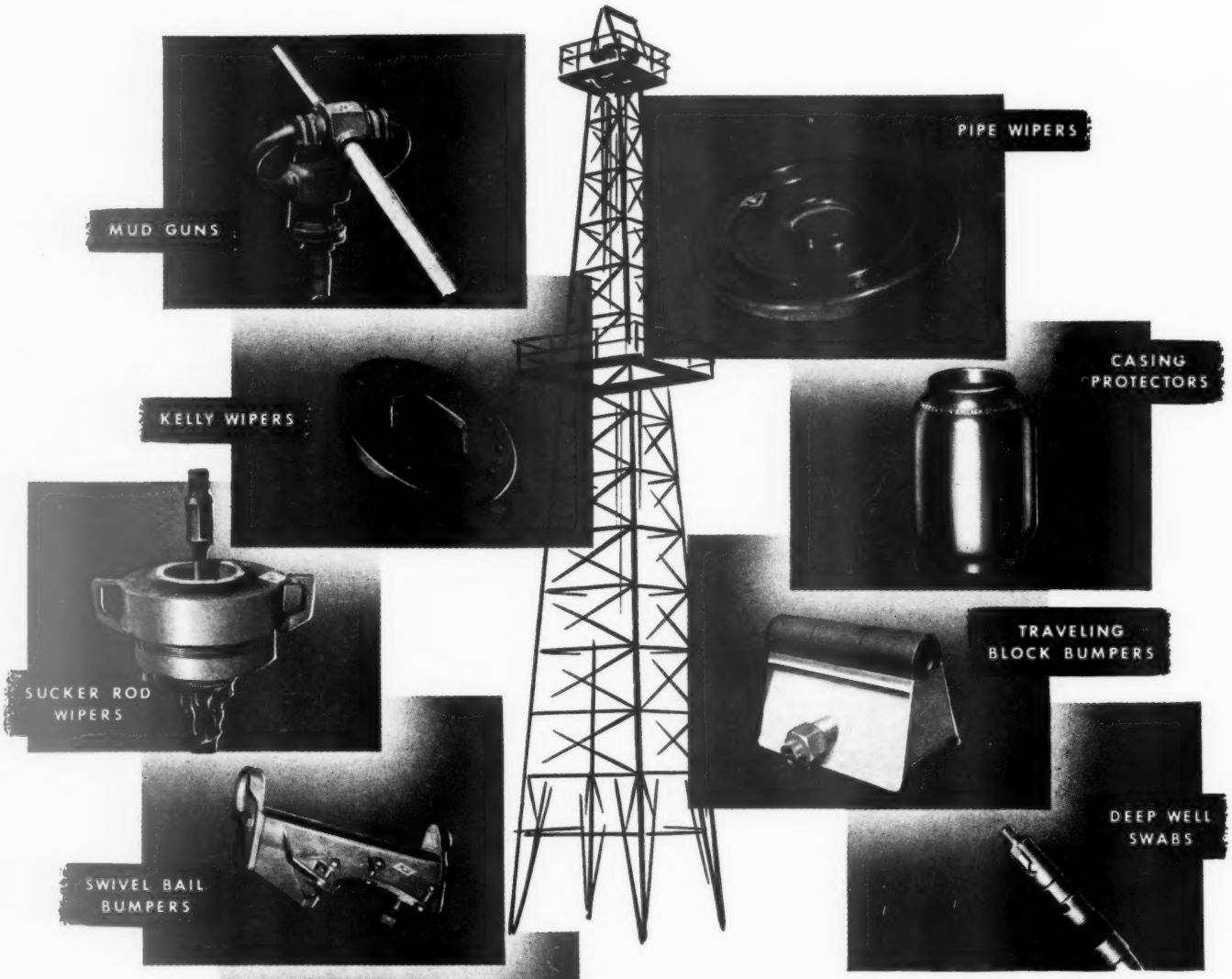


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# FACTORS IN THE SELECTION AND USE OF SUCKER-ROD PUMPS

Fig. 1 "A" shows a cold drawn working barrel with upper and lower couplings, and a standing valve assembly that may be pulled with the sucker rods, if desired. The traveling valve consists of a simple 4-cup assembly. Similar traveling valves are commonly equipped with from 4 to 12 cups, and larger numbers are sometimes used.

Fig. 1 "B" illustrates a tubing pump equipped with a metallic plunger, an extension nipple, and an oversize standing valve. This assembly also is equipped with a closed cage, and ball and seat below the plunger. A closed cage valve attached to the bottom of the plunger is often referred to as a "gas valve" inasmuch as the clearance space is reduced with a valve at this point and the pump will handle gas with less danger of gas lock.

It is desirable to permit a metallic plunger to stroke out both ends of the barrel a short distance to distribute wear over the entire length of the barrel. This permits the use of an oversize plunger in many cases, to compensate for barrel wear, and to reduce slippage, without the necessity for refinishing the barrel. The lower extension nipple shown in Fig. 1 "B" permits the plunger to stroke out the bottom of the barrel the desired amount without striking the standing valve.

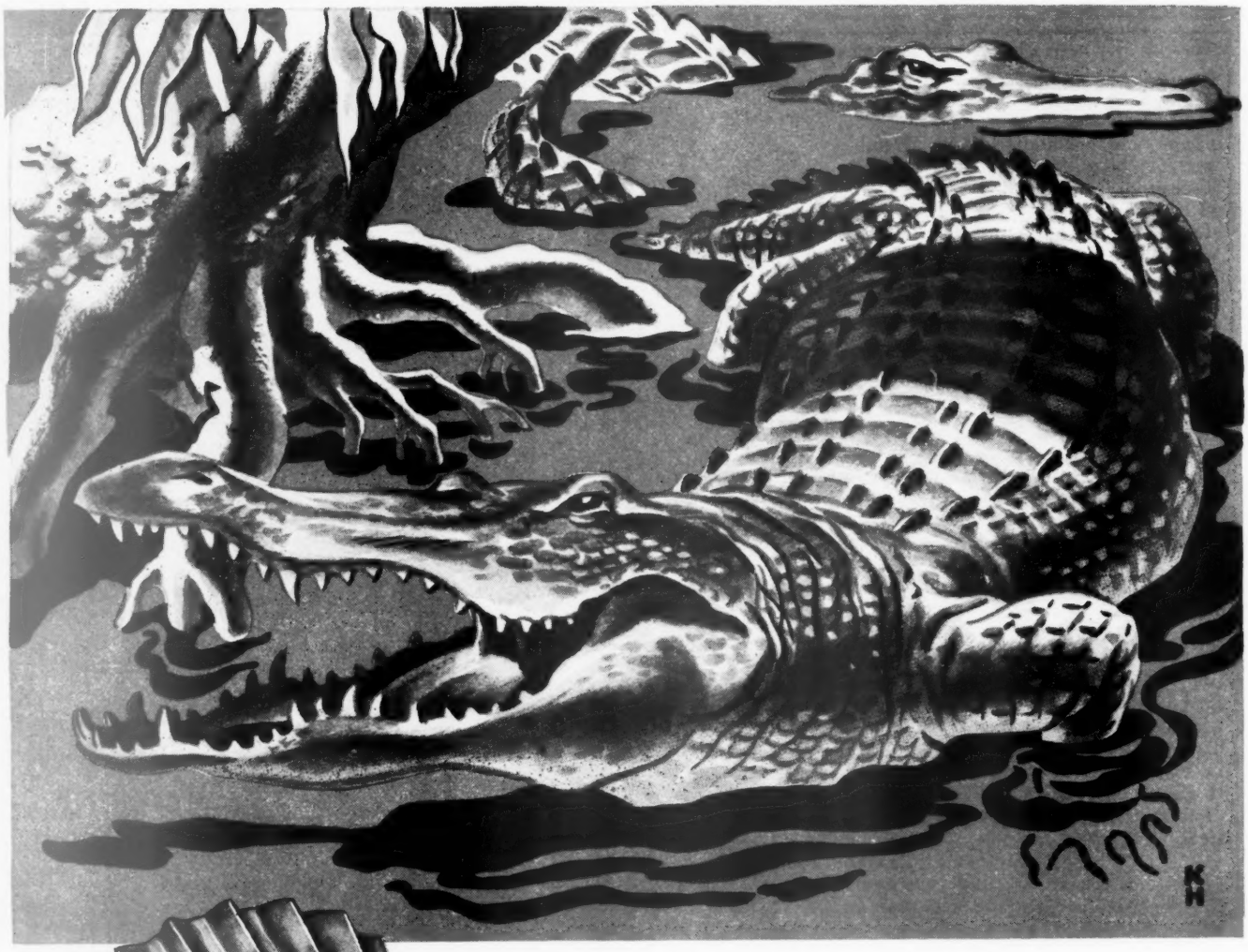
Fig. 1 "C" shows a stationary barrel, top-seating "insert" or "rod" type pump equipped with cups and composition rings. A stationary barrel pump may be designed for top seating, as shown, or for bottom seating. Top seating is preferred wherever it is possible to use it, as this arrangement provides a seal just below the oil discharge from the pump to the tubing and prevents sand or other solid material from settling between the barrel and the tubing, thereby minimizing the chances of the pump becoming sanded in place so it cannot be pulled with the rods.

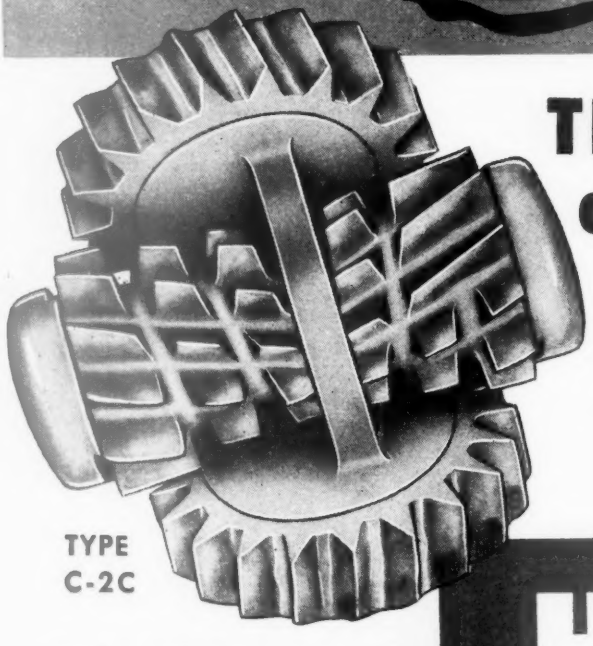
Bottom seating is necessary if the rod pump is to be seated in a tubing pump barrel that still has the lower coupling in place, if the length of the rod pump barrel is greater than that of the barrel used for seating. With bottom seating the pump barrel extends upward into the tubing and there is no circulation of well fluid around the outside of the barrel. For this reason, the pump is more likely to become sanded in place, and top seating is recommended wherever it can be used.

The stationary barrel pump shown in Fig. 1 "C" is fitted with a "sand check," which consists of a drop valve mounted in the cage of the valve rod guide and loosely fitted around the valve rod. This drop rises on both the up-stroke and the down-stroke of the plunger, or traveling valve, to permit the discharge of well fluid. If the pump is shut down, however, the drop rests on its seat and prevents suspended sand that settles to the bottom of the tubing from entering the pump barrel where it may cause the pump to jam when it is again started. A "sand check" is important in a pump of this type when used in wells producing appreciable quantities of sand. There is an unavoidable restriction above the pump barrel to provide for the seating device and the valve rod, and any considerable quantity of sand would be extremely difficult to force through this restriction. It is pointed out that one-tenth of one per cent by volume of suspended sand in a 4000-ft well will result in a solid sand pack 4 ft in length in the tubing if all the sand settles to bottom, or a much greater length pack if it is permitted to settle into the pump barrel, which necessarily is much smaller than the tubing. A sand pack of this type usually is dislodged from the tubing without difficulty by pumping fluid through it for a period of time, but if it is permitted to settle into the pump barrel it has to be removed on the first stroke, if at all, and the pump is very likely to jam.

**FIG. 1. Typical pump assemblies.**

Taken from the article "Factors to be considered in the selection of subsurface sucker-rod pumps," by R. L. Chenault, presented before The American Society of Mechanical Engineers, Houston, Texas, October 5-8, 1947, and published in *The Petroleum Engineer*, January, 1948, pages 132 to 150, inclusive.





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# FACTORS IN THE SELECTION AND USE OF SUCKER-ROD PUMPS

Fig. 1 "D" shows a traveling barrel type of rod pump fitted with a metallic plunger. This type of pump is necessarily bottom seating but it is not as susceptible to sanding in place as is the stationary barrel pump with bottom seating because there is a continual surging of well fluid in and out of the lower end of the barrel while in operation, and sand cannot settle into the barrel when shut down. Sand may settle below the barrel and prevent full travel on the down stroke, however.

The pumps shown in Fig. 1 are all of one-piece, "full-barrel" construction, and the seating devices shown consist of assemblies of seating cups, or seating rings, which form a tight friction fit in the seating coupling, nipple, or barrel in which they are seated. Barrels also may be of "liner barrel" construction in which the wearing portion of the barrel may consist of sectional liners, or of a one-piece liner, inserted into a steel outer tube.

Fig. 2 shows a sectional liner tubing pump barrel assembly with a plunger but without valves and other fittings. In this case the liners are 12 in. long and are accurately honed and faced before assembling in the steel jacket. In order to obtain perfect alignment of the liner sections they are assembled on an expanding mandrel before inserting into the jacket. The end collars are tightened while the mandrel is in place and the mandrel is then removed. The sectional liner method of barrel construction permits barrels of any desired length to be manufactured to a high degree of accuracy without excessive machining difficulties.

Fig. 3 shows a sectional liner rod pump assembly of the traveling barrel type with a mechanical bottom lock hold-down mandrel for holding the pump in position and forming a seal to prevent fluid leakage. A complete bottom lock hold-down assembly consists of a mandrel, as shown in Fig. 3, and a special seating shoe that must be attached to the well tubing. A typical bottom lock hold-down and shoe assembly is shown in Fig. 4.

The cup or ring type hold-down is generally satisfactory for relatively shallow wells where bottom-hole temperatures are not excessively high, but the mechanical hold-down is preferred for wells more than 4000 ft in depth and where bottom hole temperatures are above 150 F. Mechanical hold-downs for top seating stationery barrel rod pumps also are used to some extent at the present time and doubtless they will become more popular for deep well applications.

In considering the type of pump to be selected for any particular application it is well to list a number of the more serious adverse conditions likely to be encountered in various pumping areas and the precautions to be taken to meet these conditions. In general, it can be said that the pumping of oil wells often presents the widest variety of adverse conditions to be met in a single installation of any pumping application with which the writer is familiar. These may include high discharge pressures, low intake pressures, severe abrasive conditions resulting from sand or other solids in suspension, severe corrosive conditions resulting from corrosive gases or salt waters; deposits of lime, salts, or other solids from the water pumped, paraffin deposits from the oil pumped, and the fact that the pump must handle liquids, permanent gases, and condensible vapors under the pressure and temperature conditions existing at the pump. Strong magnetic forces are often encountered that may interfere with valve action when the valves are made of magnetic material, and electrolytic corrosion is likely to occur as a result of using dissimilar materials.

The high differential pressures encountered in pumping deep wells require an effective sealing or packing means on the traveling valve, or plunger. For wells of extreme depth a closely fitted metallic plunger is almost always used to form a satisfactory seal with the barrel. Such plungers are commonly supplied with clearances of 0.001 in., 0.003 in., or 0.005 in. in the barrel. Such plunger fits are commonly referred to as —1, —3, and —5 fits, meaning that the plunger is 0.001 in., 0.003 in., 0.005 in., etc., smaller than the nominal ID of the barrel. The API tolerance for liner barrels is + 0.0012 in. — 0.0002 in. for all sizes, and the tolerance for plungers is + 0.0000 in., — 0.0005 in., making it possible for the fit of a — 1 plunger, for example, to vary from 0.0008 in. to 0.0027 in diametral clearance.

Most subsurface pump manufacturers provide both plain and corrugated plungers in various materials. It has never been conclusively demonstrated that either type of construction has any particular advantage over the other. Many operators feel that grooves facilitate lubrication of closely fitted plungers by providing spaces for the well fluid to accumulate in considerable quantities. However, there is considerable slippage past any plunger operating under usual conditions, where the differential pressure across the plunger is several hundred, or even thousands of pounds per square inch, and adequate lubrication should be provided with either type plunger if the fluid has any lubricating value. One possible advantage of a grooved plunger is that any solid particle, such as a sand grain or a steel chip, that gets between the plunger and the barrel and tends to score the barrel and plunger, may become lodged in a plunger groove and do no further damage; with a plain plunger, it could not escape from the finished surfaces until it traveled the full length of the plunger. On the other hand, a grooved plunger stroking out of a barrel affords a better opportunity to pick up solid material and carry it into the barrel.

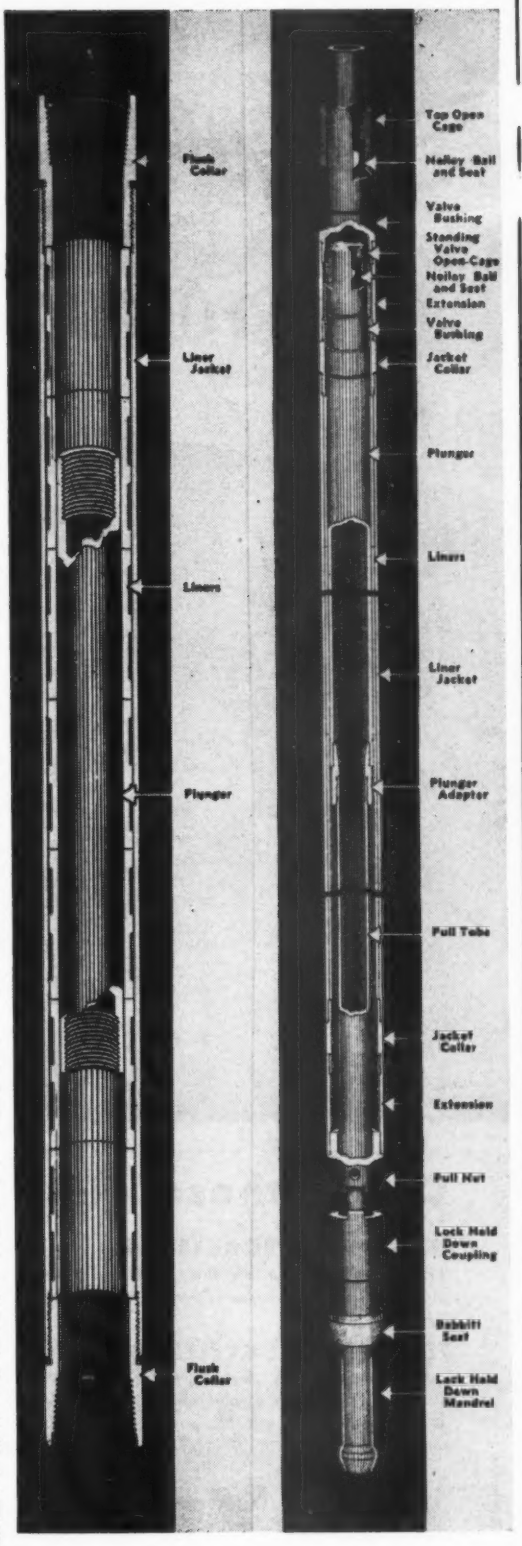


FIG. 2. Sectional liner tubing pump barrel with plunger.




FIG. 3. Sectional liner traveling barrel rod pump assembly.

Taken from the article "Factors to be considered in the selection of subsurface sucker-rod pumps," by R. L. Chenault, presented before The American Society of Mechanical Engineers, Houston, Texas, October 5-8, 1947, and published in *The Petroleum Engineer*, January, 1948, pages 182 to 150, inclusive.

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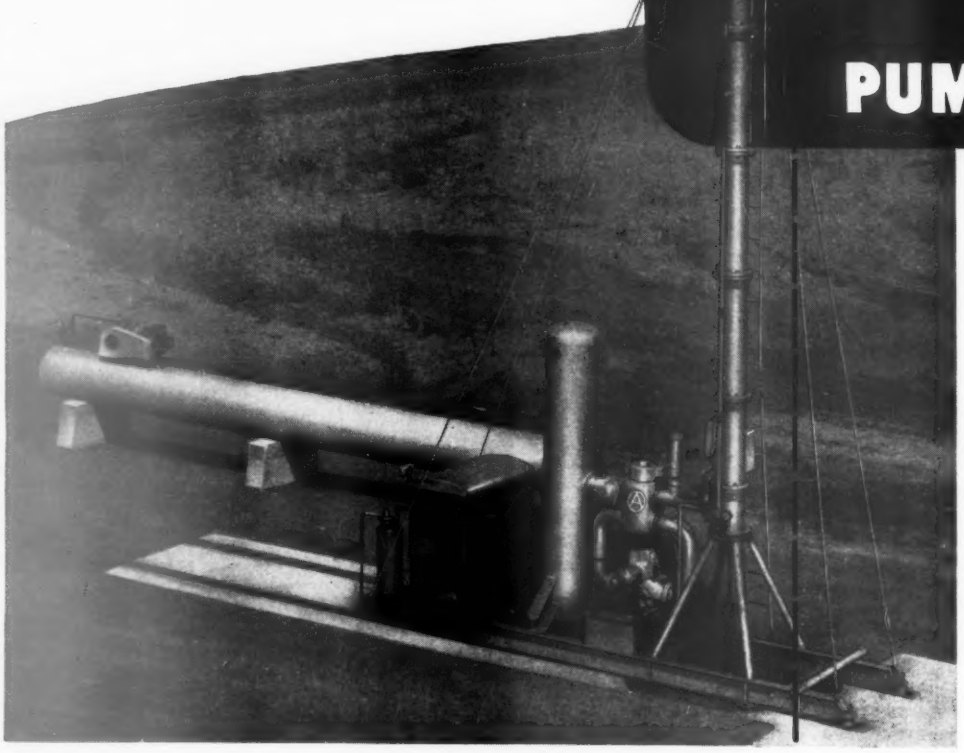

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**INCREASED STROKE LENGTH** — up to 26½ feet — minimizes effect of stroke loss due to rod and tubing stretch, increases plunger travel, decreases frictional wear, and assists in handling gassy fluids.

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# PROPERTIES OF INTERMEDIATE ALLOY STEELS AT ELEVATED TEMPERATURES

## ● Bibliography.


"Influence of Carbon Content on the High Temperature Properties of Steels," A. E. White, C. L. Clark, and R. L. Wilson, *ASM Transactions*, Vol. 23 (1935), pp. 995-1021.

"Influence of Heat Treatment on Creep of Carbon-Molybdenum and Chromium-Molybdenum-Silicon Steel," R. F. Miller, R. F. Campbell, R. H. Aborn, and E. C. Wright, *ASM Transactions*, Vol. 26 (1938), pp. 81-101.

"Compilation of Available High Temperature Creep Characteristics of Metals and Alloys." Published in 1938 by ASTM and ASME.

"High Temperature Strength of Steels," R. L. Wilson, *Metal Progress*, May, 1938, pp. 499-505.

"Heat Characteristics of 5 Cr-Mo-Si Steels," A. E. White and C. L. Clark, *Oil and Gas Journal*, Vol. 37, December 1 (pp. 43, 44, 46) and December 8, 1938 (pp. 43, 45, 46, 48).

"The Strength of Metals at Elevated Temperatures," R. F. Miller, *Mechanical Engineering*, Vol. 61 (1939), pp. 589-594.

"The Creep Strength of Seventeen Low Alloy Steels at 1000 F," R. F. Miller, W. G. Benz, and W. E. Unversagt, *ASTM Proceedings*, Vol. 40 (1940), pp. 771-781.

"High Temperature Rupture and Creep Tests," E. L. Robinson, *ASTM Proceedings*, Vol. 40 (1940), pp. 811-821.

"Some Effects of Composition and Heat Treatment on the High Temperature Rupture Properties of Ferrous Alloys," R. H. Thielmann, *ASTM Proceedings*, Vol. 40 (1940), pp. 788-810.

"Properties of Carbon and Alloy Steel Tubing for High Temperature—High Pressure Service," *Technical Bulletin No. 6D (1941) and 6C (1938)*, Babcock and Wilcox Tube Company, Beaver Falls, Pennsylvania.

"Alloy Steels for High Temperature Service—Their Properties Compared," R. F. Miller, G. V. Smith, and P. A. Jennings, *Metals and Alloys*, Vol. 16 (1942), pp. 438-441, 881-855.

"Technical Data for Refineries," *National Tube Company Bulletin 26* (1942).

"Effect of Deoxidation Practice on Creep Strength of Carbon-Molybdenum Steel at 850 and 1000 F," R. F. Miller, *ASME Transactions*, Vol. 65 (1943), pp. 309-316.

"Influence of Strain Rate on Strength and Type of Fracture of Carbon-Molybdenum Steel at 850, 1000 and 1100 F," R. F. Miller, G. V. Smith, and G. L. Kehl, *ASM Transactions*, Vol. 31 (1943), pp. 817-844.

"Iron Alloy Scaling," M. J. Day and G. V. Smith, *Ind. Eng. Chem.*, Vol. 35 (1943), pp. 1098-1103.

"Creep Strength, Stability of Microstructure and Oxidation Practice of Cr-Mo and 18 Cr-8 Ni Steels," R. F. Miller, W. G. Benz, and M. J. Day, *ASM Transactions*, Vol. 32 (1944), pp. 381-400.

"Intercrystalline Cohesion of Metals," E. R. Parker, *ASM Transactions*, Vol. 33 (1944), pp. 150-162.

"Wrought Heat Resisting Alloys for Gas Turbine Service," C. T. Evans, Jr. *Metal Progress*, November, 1945, pp. 1083-1095, 1126.

"The Effect of Carbide Spheroidization Upon the Rupture Strength and Elongation of Carbon Molybdenum Steel," S. H. Weaver, *ASTM*, 1946, Preprint No. 55.


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Taken from the exclusive article, "Intermediate alloy steels at elevated temperatures," by R. F. Miller, Research and Technology Division of Carnegie-Illinois Steel Corporation, published in *The Petroleum Engineer*, January, 1948, pages 178 to 189, inclusive.

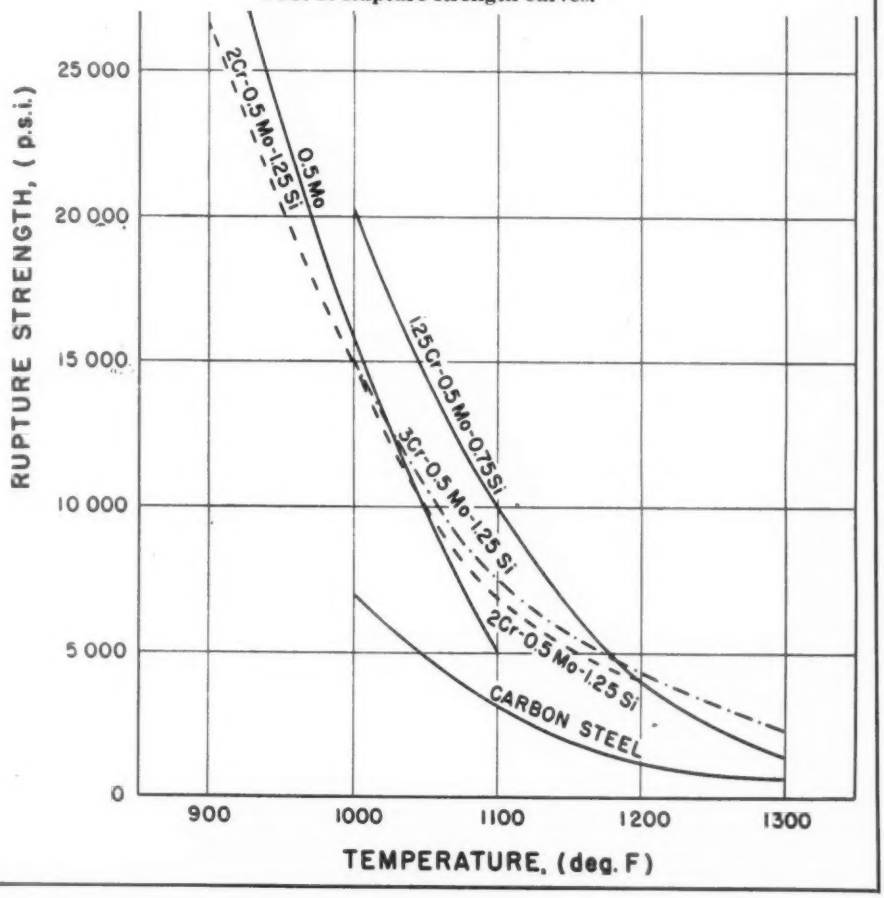
**TABLE 8. 2.25 per cent Cr, 1 per cent Mo—properties at elevated temperatures*. Composition range covered by specifications (per cent).**

| C | Mn | Si | P | S | Cr | Mo |
|---|---|---|---|---|---|---|
| 0.15 max | 0.30/0.60 | 0.50 max | 0.030 max | 0.030 max | 2.00/2.50 | 0.90/1.10 |

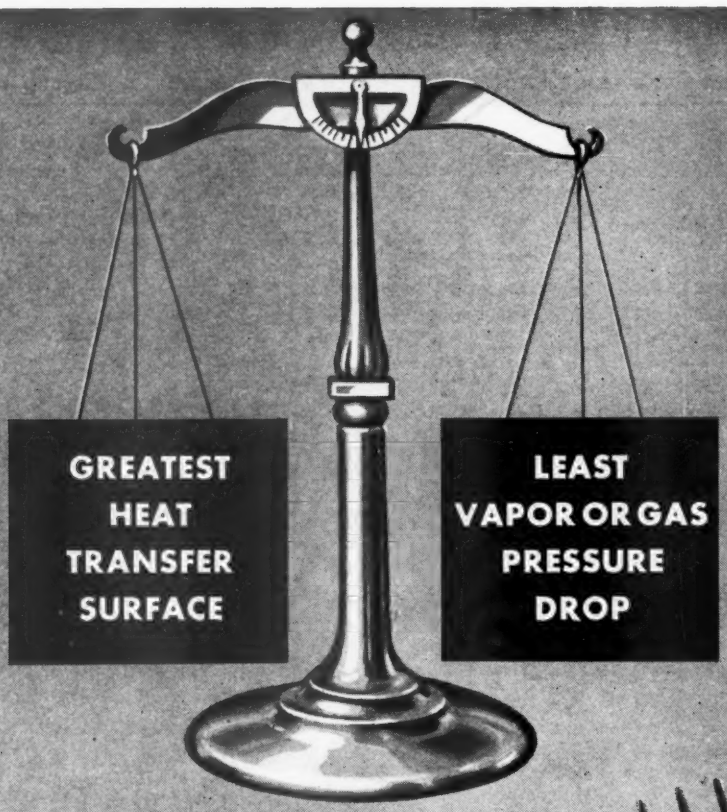
| Property | Temperature, F | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 |
| ASME Maximum allowable stress (1000 psi) | 12.0 | 11.8 | 10.0 | 6.25 | 3.7 | 1.95 | | |
| Tensile strength (1000 psi) | 68.5 | 66.5 | 63 | 53 | 42.5 | 32.5 | 22.5 | 14.0 |
| Yield strength (1000 psi) | | | | | | | | |
| Elongation (per cent in 2 in.) | 23 | 27 | 31 | 36 | 45 | 57 | 66 | 76 |
| Reduction of area (per cent) | 61 | 65 | 71 | 81 | 90 | 93 | 96 | 99 |
| Creep strength 1 per cent in 10,000 hr (1000 psi) | | | 40.5 | *11-16.3* 13 | *5.6-9.2* 7.3 | *4.2-4.5* 4 4 | | |
| Creep strength 1 per cent in 100,000 hr (1000 psi) | | | 22 | *6.5-7.6* 7.0 | *3.6-4.8* 4.2 | *2.2-3.6* 2.4 | | |
| Rupture strength 1000 hr—(1000 psi) | | | | | | | | |
| Rupture strength 10,000 hr—(1000 psi) | | | | | | | | |
| Oxidation (weight loss in grams per sq in. after 168 hr in air at the indicated temperatures) | nil | nil | nil | 0.03 | 0.10 | 0.32 | 0.65 | 1.01 |
| Linear thermal expansion (inches per foot—from 70 F to the indicated temperatures | | 0.066 | | 0.087 | | 0.110 | | |

*Values in italics show spread of available data, and accompanying single values are a conservative average of the data. Single values, only, represent limited data.

**FIG. 3. Rupture strength curves.**



# Why the G-R K-FIN design balances these two ideals




Condensing or cooling vapors or gases of low heat conductivity with water normally requires large units with a multiplicity of tubes in conventional designs.

However, the G-R K-Fin Vapor Condenser or Gas Cooler requires only a comparatively small number of heat transfer elements to condense a vapor or cool a gas. This is because of the helical K-Fins which have 6 to 8 times the external heat transfer surface of bare tubes. Therefore, the unit has wide tube spacing that provides extremely low pressure drop, and at the same time gives large free area of flow in a shell of reasonable size.

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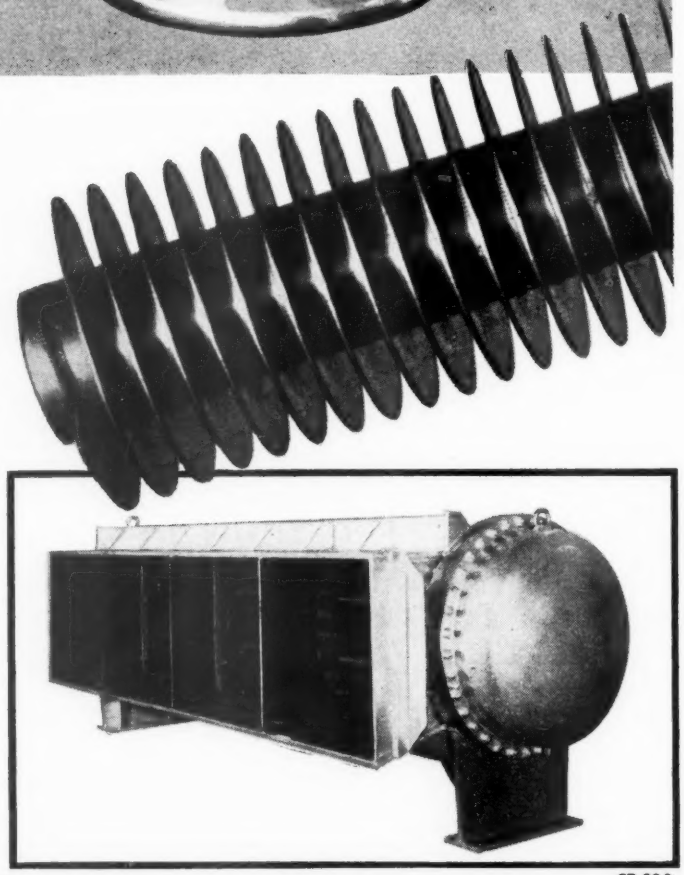
The many types of G-R K-Fin units and their important distinctive advantages of design and construction are explained in our Bulletin 1626 which will be sent on request.



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# DESIGN AND CONSTRUCTION OF GAS COMPRESSOR PLANTS

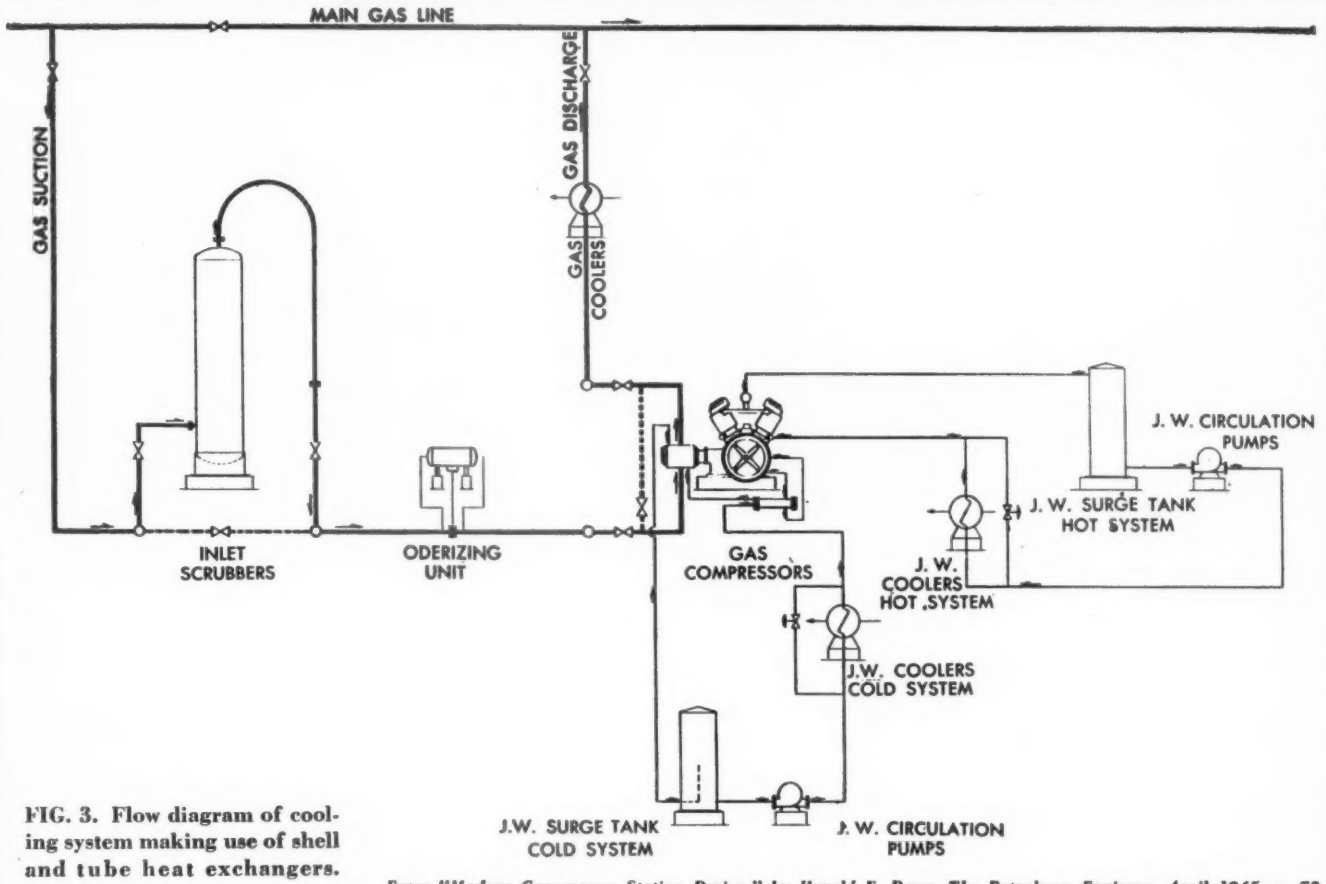



**FIG. 3. Flow diagram of cooling system making use of shell and tube heat exchangers.**

*From "Modern Compressor Station Design," by Harold F. Dawe, The Petroleum Engineer, April 1945, p. 78.*

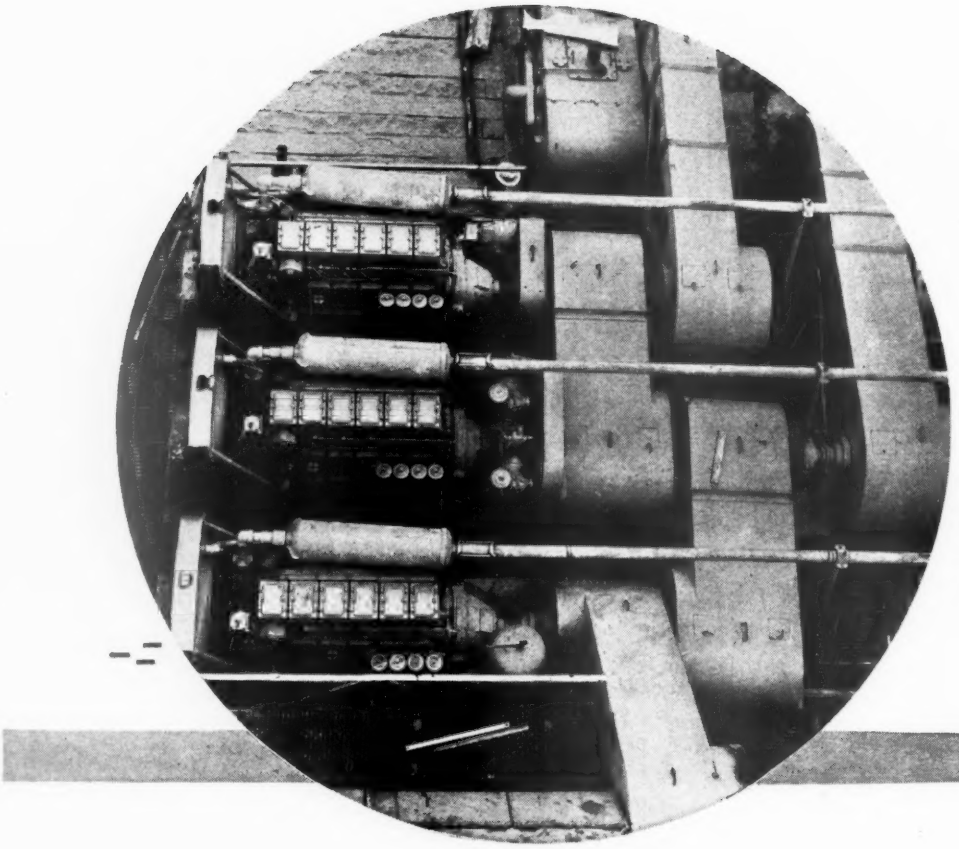
As the power requirements for the circulation of cooling water are considerable, any system that does not provide for effective heat exchange with a minimum of pumping may prove to be quite expensive. In the modern compressor plant water cooling is required for compressor engine jackets, electric generator engine jackets, compressor cylinders, lubricating oil coolers, and for intercoolers and aftercoolers of the compressed gas. The use of a common source of cooling water in one continuous system does not permit desirable temperature and quality control, so as a substitute a two-circuit system has been developed by Dawe[10] that provides low power cost, close temperature control, and which may be modified to meet requirements of warm and cold climates. Two separate systems are used. One, the hot system, circulates water through the compressor cylinder jacket and generator jackets in parallel. The proper volume of cooling water is carried 140°F. and has a maximum rise of 10°F. Fig. 2 shows diagrammatically the flow in such a system using atmospheric sections. Fig. 3 shows a similar system making use of shell-and-tube exchangers. This type of hot system may have the temperature controlled by installing an automatic control to bypass the cooling coils. The temperature rise is small and the quantity of water circulated and in makeup is at a minimum so water quality is easily controlled. The second, or cold system, circulates water through the compressor and generator oil coolers in parallel and finally through the compressor cylinder jackets, the excess water flow being bypassed. This volume of water is such that the temperature may be controlled by use of an automatically controlled bypass valve, and the closed system allows for close quality control with little makeup water. This system operates at a temperature of about 110°F. inlet and about 120°F. outlet.

The use of the two separate systems allows segregation of cooling coils in the cooling tower and better distribution of cooling water.

## ● References.


1. "The Criteria for Determining Oil Fields' Susceptibility to Secondary Recovery Methods", API, First Supplement to "Secondary Recovery of Oil in the United States", 1943.
2. R. C. Earlougher, AAPG Symposium on Secondary Recovery, 1943.
3. "Air and Gas Repressuring in Pennsylvania", R. B. Bossler and Parke A. Dickey, API, "Secondary Recovery of Oil in the United States".
4. "Gas Repressuring in the State of Texas", Jo H. Cable, API, "Secondary Recovery of Oil in the United States", Jo H. Cable. Also see API First Supplement to "Secondary Recovery of Oil in the United States" in Chapter on "Preliminary Tests".
5. "The Development and Operation of Gas Repressuring Projects", Paul D. Torrey, API, "Secondary Recovery of Oil in the United States".
6. "Air and Gas Compression", T. T. Gill, John Wiley and Son, 1941.
7. "Effect of Supercompressibility of Natural Gas Upon Compressor Performance", Robert S. Ridgeway, *The Oil and Gas Journal*, May 12, 1945, pp. 104-118.
8. "Calculating Pipe Sizes for Compressor Cylinders", B. C. Thiel, *The Petroleum Engineer*, November, 1943, p. 135.
9. "Controlled Water Jacket Cooling Reduces Maintenance Costs", B. C. Thiel, *Petroleum Refiner*, Vol. 23, No. 6, pp. 197.
10. "Modern Compressor Station Design," Harold F. Dawe, *The Petroleum Engineer*, April, 1945, p. 75.
11. "Gas Compressor Station Design", B. C. Thiel, *The Petroleum Engineer*, February, 1944, p. 151.
12. "Correcting Problems Caused by Scale and Corrosion in Compressor Stations", Paul V. Sanders, *The Petroleum Engineer*, March, 1945, p. 208.
13. "Control of Compressor Cooling Water", E. G. Hammerschmidt, *The Petroleum Engineer*, March, 1945, p. 192.
14. "Modern Compressor Stations", B. C. Thiel, Paper published by The Cooper-Bessemer Corporation, Mt. Veron, Ohio.
15. "Explosive Mixtures on Air Drive Operation", R. F. Nielsen and S. T. Yuster, *The Petroleum Engineer*, June, 1945, p. 96.
16. "The Principle of the Safety Cylinder as an Explosion Preventer in Air-Gas Compression" Frederick Squires, Illinois Geological Survey, Circular 93, 1943.


Taken from the article "Design and construction of compressor plants," by Paul D. Torrey that was presented before American Petroleum Institute Southwestern District Division of Production, Shreveport, Louisiana, May 17 and 18, 1946, revised in 1947, and published in *The Petroleum Engineer*, December, 1947, pages 103 to 126, inclusive.



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# PROPERTIES OF HIGH YIELD STRENGTH SEAMLESS LINE PIPE

*Tensile and bend tests.* Tensile tests of the original pipe and plate material were conducted in accordance with Specification API 5-L. The tensile test specimen for unwelded pipe or plate is shown in Fig. 2. Tensile test specimens of welded pipe sections are also shown in Fig. 2 and, except where noted in the investigation, excess weld metal was not machined from the specimen. Although tensile test strip specimens from welded pipe are usually prepared by oxyacetylene flame cutting, in this investigation the specimens were machined from the pipe.

A guided bend test with a 5/8-in. radius plunger was used. Except where noted in the investigation, the guided bend test specimens were similar to the tensile test specimens of the welded pipe sections shown in Fig. 2. In the bend test, pressure was applied in a tensile testing machine until a crack appeared or until completion of a 180-deg bend. As the 5/8-in. radius plunger was smaller than the AWS standard 3/4-in. radius plunger, the bends made in these experiments can be considered more severe than the standard guided bend test. Although the influence of aging on bend test results is frequently considered significant, this factor was not evaluated.

*Hardness tests.* The Vickers hardness tests were conducted with a 1 and 10 kg load on a standard Vickers hardness tester. Caution was exercised in applying a suitable load during testing because of inertia effects in the machine. In addition to these tests, hardness determinations with a 0.5 kg load were made by the U. S. Steel Corporation Research Laboratory. A transverse test specimen selected from the weld was polished for hardness testing. The specimen was machined from the welded pipe or plate section so as to eliminate any effects from heating. The locality of hardness surveys is shown in Fig. 2.

In determining the maximum hardness of weld, considerable care must be exercised to obtain satisfactory results. The U. S. Steel Corporation Research Laboratory developed the 0.5 kg load hardness testing machine used in this investigation. This machine, referred to as "Intermediate DPH Tester," comprises an indenting mechanism, a mechanical stage for holding the specimen, a microscope for locating the test field and measuring the impression, and a control box for automatically spacing the impressions. The reading error in the range of hardness investigated with a 0.5 kg load is less than 1 per cent. The error in hardness number for this reading error is not more than ± 2 per cent.

*Other tests.* X-ray examination of welded pipe joints was conducted with a 185,000-volt X-ray machine and radiographs of the complete welds were made. Any indications in the radiographs of cracks or other defects in the weld were confirmed by metallographic examination.

Metallographic examination of the weld heat-affected zone base metal and the base plate was conducted on a transverse weld section which was also used for hardness testing. Weld specimens were machined from the pipe in order to eliminate the possible effect of flame cutting.

**TABLE 3. Bend and tensile test results of welded pipe.**

| Treatment | Weld rod | Face bend | | Root bend | | Tensile | | |
|---|---|---|---|---|---|---|---|---|
| | | No. of bends | Angle | No. of bends | Angle | Yield 1000 psi | Ultimate 1000 psi | Per cent elongation in 2 in. |
| **26 in. OD x 0.303" wall (0.36-0.39 per cent carbon, 1.24-1.28 per cent manganese steel)** | | | | | | | | |
| Unground | * | 6 | 135° | 6 | 160° | 68 | 91 | 22 |
| Cover bead ground flush | * | 6 | 170° | | | | | |
| Root bead ground flush | * | | | 6 | 175° | | | |
| Cover bead and root bead ground flush | * | 3 | 180° | 3 | 140° | | | |
| **20-in. OD x 0.312" wall (0.22 per cent carbon, 0.47 per cent manganese steel)** | | | | | | | | |
| Unground | † | 6 | 180° | 6 | 180° | 46 | 66 | 29 |
| Cover bead ground flush | † | 6 | 180° | | | | | |
| Root bead ground flush | † | | | 6 | 180° | | | |

*Rod combination—$V_3$—E-7010 (root), W-E-8011 (filler), W-E-8011 (cover).
†Rod combination—U-E6010 (root), U-E6010 (filler), U-E6010 (cover).

**TABLE 4. Influence of preheat, postheat, and pipe temperatures when welding 0.36-0.39 per cent, 1.24-1.28 per cent Mn steel.**

| Heat treatment | Weld rod | Face bead angle | Root bead angle | Weld tensile tests | | |
|---|---|---|---|---|---|---|
| | | | | Yield 1000 psi | Ultimate 1000 psi | Per cent elongation in 2 in. |
| Cooled to 25 F | * | 150° | 180° | 74 | 93 | 29 |
| Cooled to 25 F | ‡ | 180° | 180° | 75 | 89 | 10 |
| None (70 F) | * | 160° | 180° | 68 | 91 | 22 |
| None (70 F) | † | 160° | 180° | 79 | 94 | 10 |
| None (70 F) | ‡ | 180° | 180° | 74 | 97 | 15 |
| Preheat 250 F | * | 160° | 180° | 75 | 90 | 12 |
| Preheat 250 F | ‡ | 160° | 180° | 73 | 94 | 15 |
| Preheat 600 F | * | 140° | 155° | 72 | 92 | 13 |
| Preheat 600 F | † | 130° | 170° | 74 | 94 | 13 |
| Postheat 1000 F | * | 180° | 180° | 69 | 93 | 17 |
| Postheat 1000 F | † | 180° | 180° | 66 | 85 | 9 |

*Rod combination—$V_3$-E7010 (root), W-E8011 (filler), W-E8011 (cover).
†Rod combination—$V_2$-E7010 (root), X-E10010 (filler), X-E10010 (cover).
‡Rod combination—$V_1$-E7010 (root), X-E10010 (filler), X-E10010 (cover).

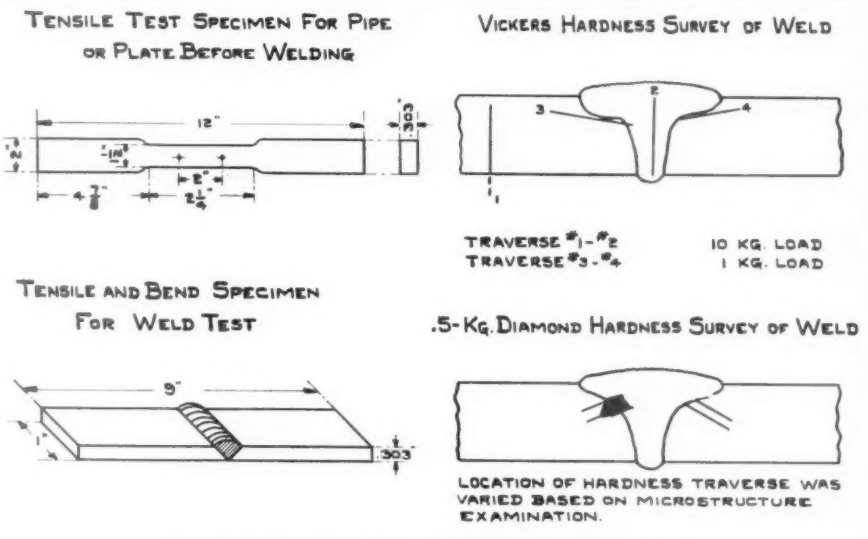
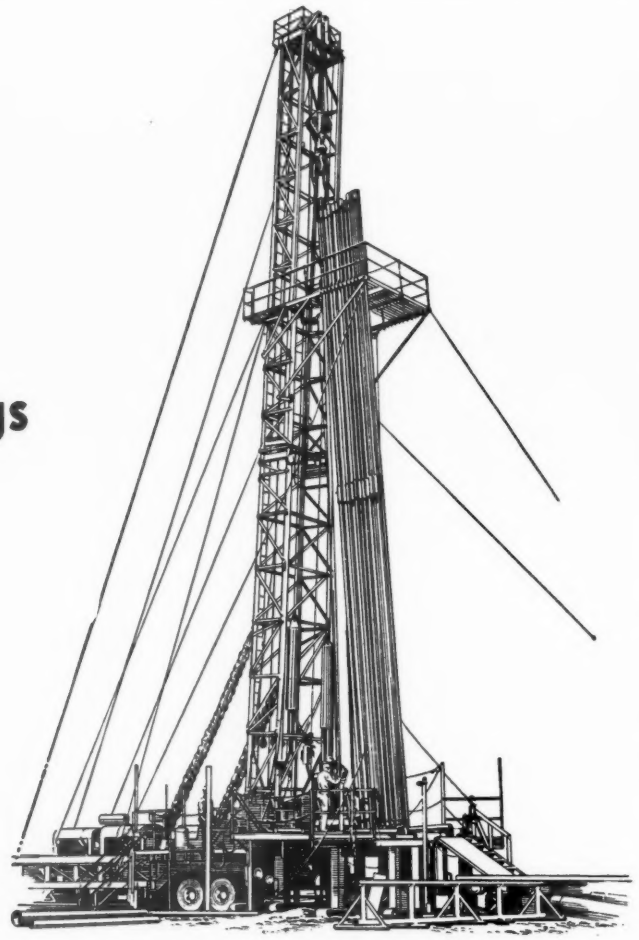



**FIG. 2. Tensile, bend, and hardness test specimens.**

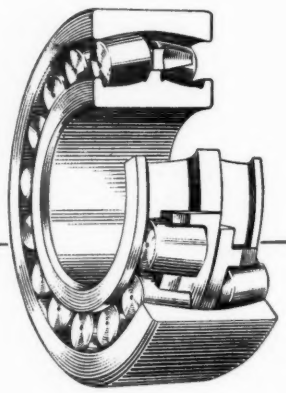
Taken from the article, "Metallurgical properties of high yield strength seamless line pipe," by A. B. Wilder[1] and J. D. Tyson[2] that was presented before the American Welding Society, Chicago, Illinois, October 18-24 and published in *Welding Journal*, and published in *The Petroleum Engineer*, February, 1948, pages 138 to 152, inclusive.

1. Chief Metallurgist, National Tube Company.
2. Chief Metallurgist, Lorain (Ohio) Works, National Tube Company, subsidiary of United States Steel Corporation.

# Trailerig Built for Long Service Life with Torrington Spherical Roller Bearings



*Cardwell Manufacturing Company, Inc. secures long, trouble-free service life through the use of Torrington Spherical Roller Bearings on the main drum of the transportable Trailerig.*



**... high capacity and precision construction of these heavy-duty anti-friction bearings assure trouble-free operation with minimum maintenance attention.**

CAPABLE OF DRILLING to 5000 feet with 4½-inch drill pipe, the transportable Cardwell Trailerig main drum is equipped for rugged service and efficient operation with Torrington Spherical Roller Bearings.

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Spherical Roller Bearings provide many other features that can extend the service life and improve the performance of drilling rigs, slush pumps, unit pumpers, transmissions, draw works, rotary table drives and other oil field equipment. Torrington's engineers have had years of experience in the design, construction and application of anti-friction bearings. Let them assist you with your friction problems. Call or write the nearest Torrington office.

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## Pipe line contractors form association

J. R. Horrigan (left), T. R. Jones, and H. C. Price

The Mid-Continent Pipe Line Section has received a charter from the Associated General Contractors of America, marking the first organization of oil country pipeliners in the United States. The charter was presented by W. S. Bellows, Houston, past president of the national association, to T. R. Jones of the Oklahoma Contracting Company, Dallas, president of the new section, during the International Petroleum Exposition in Tulsa.

Other officers are H. C. Price, H. C. Price Company, Bartlesville, Oklahoma, and Ray L. Smith, Ray L. Smith Construction Company, Eldorado, Kansas, vice president, and A. L. Forbes, Associated Contractors and Engineers, Houston, treasurer. Directors includes the officers and J. R. Horrigan of J. R. Horrigan Construction Company, Houston; J. C. Britton of Britton Contracting Company, Fort Worth, and R. H. Fulton of R. H. Fulton and Company, Lubbock, Texas.

Richard Gump, 520 Republic Bank Building, has been employed as executive secretary of the new association.

## AAODC meeting

California chapter AAODC held a well attended meeting on June 17, at the Circle J Ranch near Newhall. Among those present were Ned Brown, national president of the Association; Doug Graham, vice president for California; Brad Mills, executive vice president, Dallas; Key Trout, field program supervisor; and Mel Barlow, California State Department of Education.

The speaker of the evening was A. J. Martenson, safety director of the California Petroleum Safety Board, who outlined in considerable detail a safety program for the contractors. He summed up the costs of accidents, stressing the fact that the consumption of time in investigation frequently constitutes an item of major dimensions. This, with work stoppage, material loss, and personal injury, form reason enough for the elimination of hazards.

A. S. "Doc" Hayes, chairman of the local chapter, presided at the meeting, and besides presenting the speaker, disposed of a considerable business agenda in short order. He announced that drilling mud control classes in Bakersfield would be suspended for the summer months, but would be resumed in September, and that Long Beach classes would close down until July 6.

In the course of the evening, the chairman was authorized to appoint a committee to investigate the question of group insurance for member organizations. Brad Mills reviewed national conditions—pointing out that contract operations have increased in recent years from 50 to 85 per cent of all wells drilled. This represents more than a half a billion dollars a year, and this year will probably mean 130,000,000 ft of hole compared to 117,000,000 ft last year. Since 1941, costs have risen about 55 per cent. Rig operation costs alone in that time has upped from $750 to $1050 a day approximately—for the same size rig.

Ned Brown expressed pleasure with the manner in which the California chapter is conducting its affairs, and especially commended the fine attendance at meetings. He indicated his belief that the national organization not only passes on definite benefits to its own members, but is actually responsible for general technological advances that benefit the entire petroleum industry.

By way of a light interlude, Doug Graham, the morning tour mayor of New Orleans, related the adventures of an ambitious home owner, with an excess of energy, and a can of quick drying paint that didn't dry quite quick enough. This recitation, and all the other items on the program were tops, and Doc Hayes and his arrangers are to be congratulated on a novel gathering.

## Cloer joins Rector

L. L. Rector, president of Rector Well Equipment Company, has announced the addition of V. R. Cloer to the company's cementing division. Cloer will devote his time and effort to the sale and service of Rector Fulbore cementing equipment.

V. R. Cloer

Cloer has had many years' experience in the oil industry, having started with the Sargent Engineering Company in 1937. Since that time he has been with McQueen and Clevenger, drilling contractors, Rowan Drilling Company, and Gulf Oil Company.

## E. H. Peabody Honored

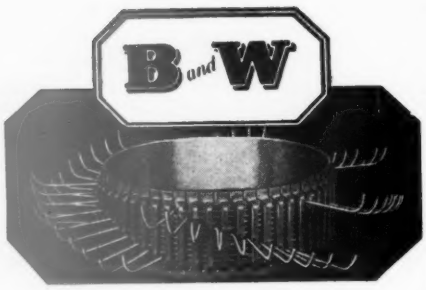
Stevens Institute of Technology conferred the degree of doctor of engineering, honoris causa, upon Ernest H. Peabody, president and founder of Peabody Engineering Corporation, New York, N. Y., at their regular June Commencement exercises. Dr. Peabody has long been active in the development and perfection of combustion equipment and introduced the first combined gas and oil burner that permitted the economical and efficient burning of either gas or oil together or singly at any one time. In addition to this, Dr. Peabody invented and perfected the wide-range mechanical atomizing fuel-oil burner, the combined pulverized coal and oil burner, and later produced the first combined burner for liquid gases and pulverized fuels. With more than a half century of research and engineering behind him, Dr. Peabody holds more than 30 patents and has been considered for many years one of the leaders in all types of combustion equipment and gas scrubbing apparatus.

Dr. E. H. Peabody

## Painting is popular

Requests for art prints of the painting, "Ancient Chinese Drilling Rig," have been heavy. Baroid Sales Division carried a reproduction in its advertisement in The Petroleum Engineer Reference Annual, page 95, this month. The scene is a 2000-year-old rig in operation with a derrick of bamboo instead of steel but, nevertheless, basically similar to modern rigs.

A print for framing may be obtained by writing Baroid, P. O. Box 2558, Terminal Annex, Los Angeles 54, California.

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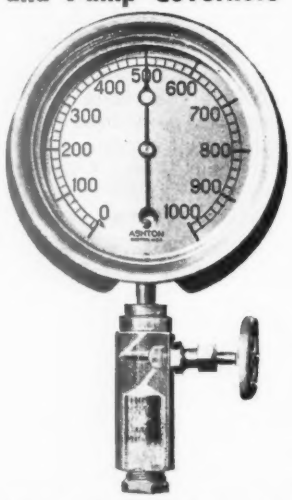


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## President Republic Supply

Dean McGee, chairman of the board of directors, Republic Supply Company, Houston, Texas, announces the election of H. B. Catlow as president of the company, effective July 1. Catlow, formerly vice president and manager of sales, succeeds A. B. Judd, who has resigned to enter business for himself. Don L. Collins, executive vice president, continues in the same capacity. Other officials of Republic are J. H. Brooks, Tulsa, vice president, and John Lollar, Jr., Houston, secretary and treasurer.

Catlow has been identified prominently with the supply business since his connection with Republic Supply Company in 1942 and has taken an active lead in the industry's efforts to restore the high standards of supply service that were disrupted during the war. Catlow came to Republic Supply from Republic Steel Corporation, former owner of Republic Supply Company. He has been in Houston since 1937 and has been associated with Republic Steel since 1923.

H. B. Catlow

A. B. Judd

Judd has been with Republic Supply since 1922 and resigned to organize his own company with headquarters in Houston. He will continue to serve as a director of Republic Supply.

## Special representative

C. F. "Cy" Johnson has recently joined Manning, Maxwell and Moore, Inc., Bridgeport, Connecticut. Johnson will have his office at 1909 Marshall Street, Houston, Texas, and will function as special representative. He will also contact all phases of the oil industry with special emphasis on broadening the usefulness of the company's products in that industry, and with a view to adding to these products.

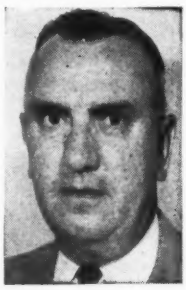
C. F. Johnson

Although for the past several years Johnson has specialized in the manufacture and sale of valves, he has also had considerable experience in the drilling and production of oil, as well as a wealth of experience in engineering, sales, and product manufacturing.

As one of the organizers of the Corex Engineering Company of Whittier, California, Johnson developed a highly successful wire-line operated oil well core-orienting device.

## Chief metallurgist

Cameron Iron Works, Houston, Texas, has announced the appointment of D. E. Wilson as chief metallurgist. Wilson is a well known industrial technician, having served as chief metallurgist for the Edward Valves, Inc. and for the Studebaker Corporation, Aviation Division, Chicago. Prior to joining the Cameron organization, Wilson was works manager for the Portland Forge and Foundry at Portland, Indiana.



D. E. Wilson

**A WAIT that isn't so "HEAVY"**

Maybe we're telling you something you already know, but steel is still a mighty scarce item. We do manage to get some and it is quickly turned into quality pumping units through modern mass production methods.

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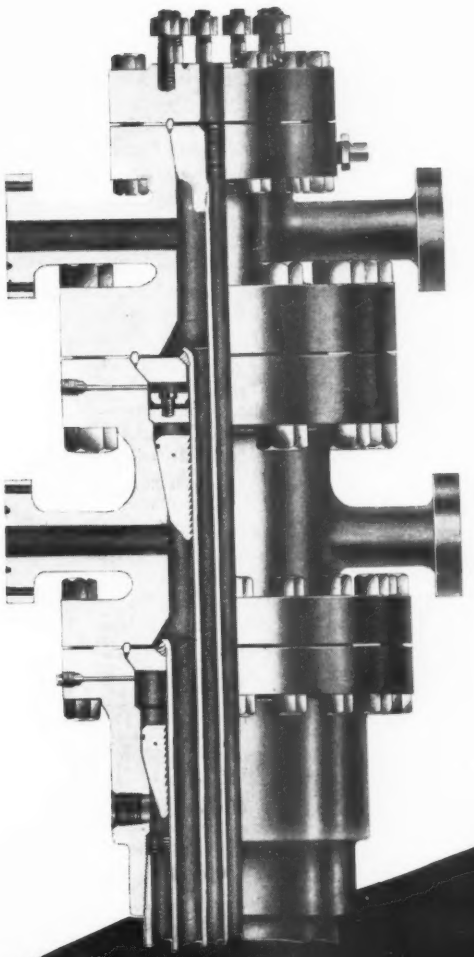

Casing and tubing heads are no place for soft, resilient seals. You have too much at stake to entrust these vital between string seals to anything less than the RECTORHEAD "RING OF STEEL," provided by a good weld plus API ring gasket.

Time and thousands of installations have proved the leak-proof permanence of the RECTORHEAD "RING OF STEEL" seal. It never requires changing . . . won't freeze or deteriorate . . . won't burn out . . . resists anti-corrosion chemicals.

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Be sure you're safe. Put on a RECTORHEAD casing head and then hookup with a RECTORHEAD Christmas Tree, that has "Ring of Steel" seals throughout.

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# running tour with men in the industry

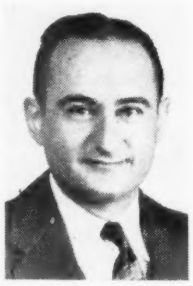
● **Dr. R. F. Faull** has been appointed to the newly created position of manager of the La Habra, California, oil field research laboratory of California Research Corporation, a Standard of California subsidiary. He will be responsible directly to Earl G. Gaylord, vice president in charge of oil field research for California Research Corporation. At the same time, it was announced that the company's two oil field research units, at Whittier and La Habra, are being combined into one organization under Dr. Faull's direction, with headquarters at La Habra.

Dr. R. F. Faull

Assisting Dr. Faull will be **Walter C. Dayhuff,** who has been named technical assistant in charge of administrative functions and surface processing research, and **Dr. M. B. Standing,** division supervisor in charge of research on drilling and production.

● **R. I. Seale,** Schlumberger Well Surveying Corporation, Dallas, Texas, has been made area representative for Northwest Texas and New Mexico. He will keep his headquarters at Dallas. **L. A. Puzin** has been made division manager for North and Central Texas with headquarters at Dallas. **A. Morazzani** has been made division manager for the Permian Basin with headquarters at Midland, Texas.

● **Sol Smith,** senior engineer in the gas department, Oil and Gas Division, Railroad Commission of Texas, resigned recently to enter private practice in consulting petroleum and natural gas engineering. Smith will open offices in the Brown Building in Austin, Texas, and will specialize in gas reserves, reservoir studies, gas proration, and various oil and gas well problems. He received a masters degree from Texas University in chemical and petroleum engineering, and has served with the commission more than seven years, during which time he was district engineer of the Pampa office and Wichita Falls office, and senior engineer at the Austin Office.



Sol Smith

He has also had varied experience in oil and gas production and transmission problems with the Magnolia Petroleum Company as district engineer on the Gulf Coast. He was with the Federal Government for three years during the war in chemical warfare service.

● **Jack Faris,** for the last 11 years identified with the sales department of The Continental Supply Company, has recently been transferred to the company's export division in New York. Faris joined Continental in April, 1937, as floorman in the Corpus Christi, Texas, store. Several months later he was moved to the Benevedes, Texas, store in the same capacity. In June, 1938, he returned to Corpus Christi as salesman and remained at that point until joining the export office with the exception of two years at Falfurrias as store manager.

● **Thomas V. Coleman, Jr.,** design engineer for Petroleum Rectifying Company at Long Beach, California, has recently been called back to active duty in the armed services. Coleman holds the rank of captain, and will return for service with the Signal Corps headquarters at Ft. Monmouth, New Jersey. Coleman joined the Petreco organization in April, 1946, after leaving the army. During World War II he saw action with the Anti-Aircraft Artillery in North Africa, Italy, and Southern France. While he was engaged in the oil industry with Petreco, Coleman was a member of ASME, and secretary of the Professional Divisions, Southern California Chapter of ASME. He was also affiliated with the CNGA.

T. V. Coleman, Jr.

● **Thomas F. Lawry** has been appointed secondary recovery engineer for Deep Rock Oil Corporation. Lawry's appointment follows on the heels of Deep Rock's acquisition of controlling interest in Sloan and Zook, one of the largest independent companies actively engaged in water flooding.

Lawry was associated with Sohio Petroleum Company and Ohio Oil Company in Kansas and will now make his headquarters in Tulsa, Oklahoma.

● **Kenneth H. Crandall,** vice chairman of the board of The California Company, has been elected a director of the Standard Oil Company of Texas. Both companies are subsidiaries of Standard Oil Company of California.

● **G. H. Supple,** who has been with the General Petroleum Corporation 23 years, has been named manager of the pipe line department, and **Laurence Andrew,** a 35-year veteran, becomes general superintendent. Other appointments are that of **V. C. Larsen,** 29 years' service, to be assistant general superintendent; **C. W. House,** 26 years, to be superintendent of the northern division with headquarters at Taft, and **L. L. Tarne,** 25 years, who is named assistant superintendent of the southern division.

● **Robert L. Kidd** has been elected a vice president of the Cities Service Oil Company (Delaware). He is a member of the board of directors and manager of the company's land and geological division; also a director of Cities Production Corporation.

● **Robert Korte,** former account executive with Brooks-Keefe advertising agency of Tulsa, has been appointed advertising manager for The Independent Petroleum Association of America, according to C. E. Buchner, executive manager. With national headquarters in Tulsa, the association of oil and gas operators has membership in every oil producing state.

Robert Korte

Korte, a native Oklahoman, has had wide experience in the advertising and market research fields, in both the Army and private agencies.

● **C. R. Végh Garzón** of Montevideo, Uruguay, has been appointed consultant in Latin America by Universal Oil Products Company. Végh Garzón who founded the South American Petroleum Institute (ISAP), has served since 1940 as president of the Uruguayan section and chairman of the International Council. He has represented Uruguay at numerous international scientific congresses.

C. R. Vegh-Garzon

Végh Garzón was chief engineer and later general manager of ANCAP during the period when the petroleum refinery was erected, which supplies the liquid fuel requirements of Uruguay. In 1946 he became technical and commercial advisor to the Refinaria de Petroleos do Distrito Federal S. A. for the construction of a petroleum refinery in Rio de Janeiro.

● **E. O. Perkins,** general superintendent of the Terminal Division of The Texas Company since 1944, has been appointed assistant general manager of the company's Marine Department. **Joseph T. Froehlich** succeeds Perkins as general superintendent of Terminals.

Perkins, born in Emporia, Texas, began work with Texaco in 1920 as a stenographer at the Port Arthur refinery, and was transferred to the Terminal Division in 1931. Froehlich began with The Texas Company in 1929 as a draftsman in the engineering department. He became assistant general superintendent of terminals in 1944.

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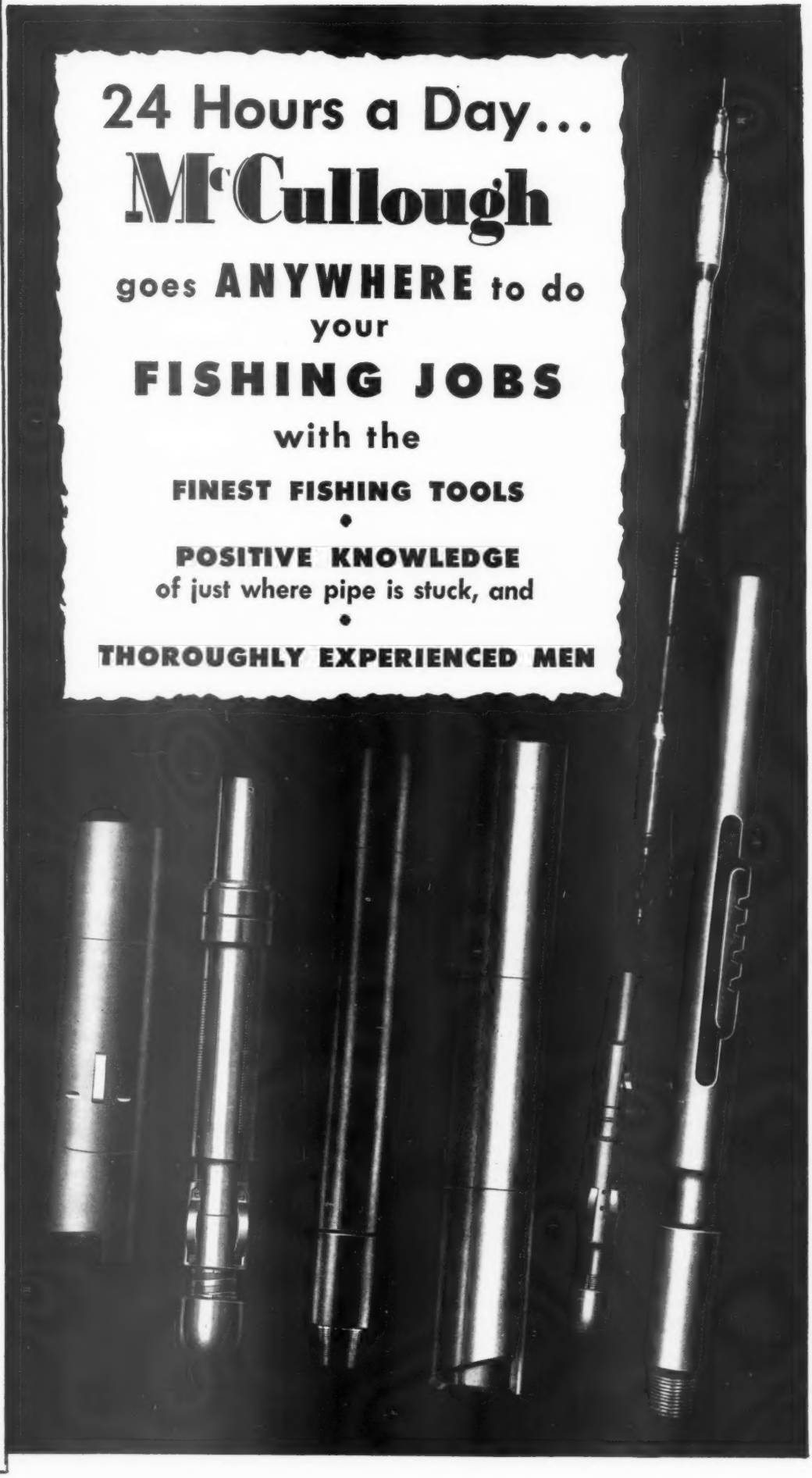

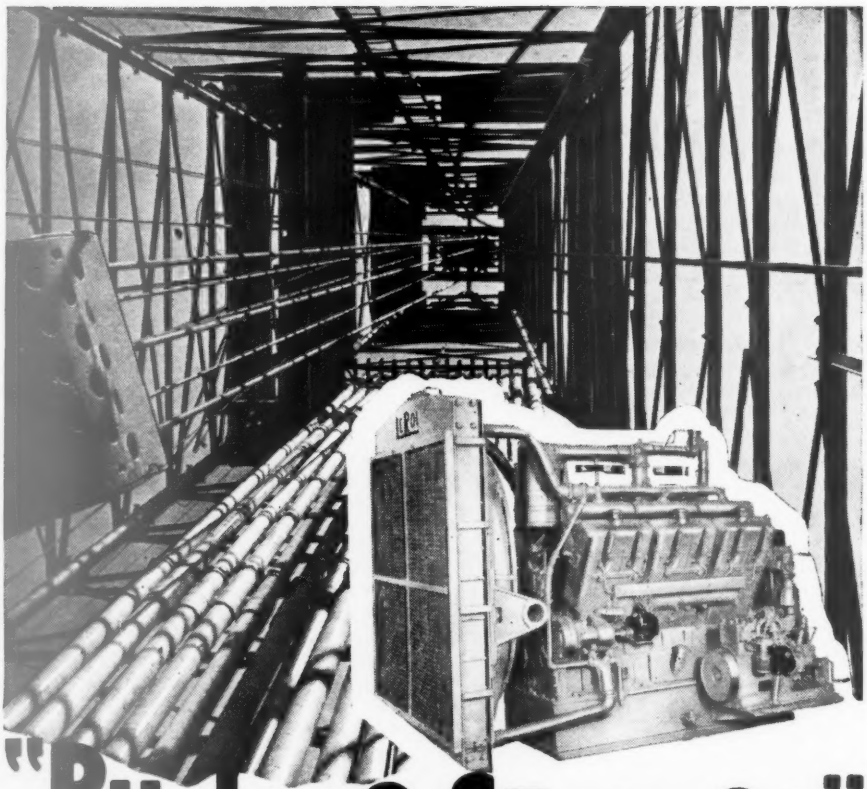

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THAT GETS *FAST* ACTION
— power your drilling rigs with hard-lugging, quick-accelerating, dependable LE ROI engines . . .

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**Kansas**
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**Illinois — Western Kentucky**
Western Machinery Company — Centralia, Illinois and St. Louis, Missouri.

**Michigan**
Hafer Engine Co. — Reed City

**Rocky Mountain Area**
Gehring Equipment Company — Casper, Wyoming.

**Northern Louisiana & Mississippi**
Ingersoll Corporation — Shreveport, Louisiana, and Jackson, Mississippi.

**West Coast**
Le Roi-Rix Machinery Co. — Los Angeles, Calif.

**Appalachian Area**
Lloyd, Smith Company — Bradford, Penn.
P. C. McKenzie Co. — Pittsburgh

**Canada**
Drilling Supplies, Ltd. — Calgary, Alberta

*Complete Sales and Service Facilities*

P-93

● **P. L. Coggeshall** has joined the sales staff of Federal Telephone and Radio Corporation, Clifton, New Jersey, associate of International Telephone and Telegraph Corporation, representing its mobile radiotelephone division in northern California and northern Nevada. Coggeshall has been connected with the radio industry since 1921.

● **D. C. (Dave) Ogden,** formerly with Baash-Ross Company in Houston, has joined the Oilfield Machine and Supply Company organization as office manager, Maarten Verhuel, president, announces. Ogden handles inside sales in his former job and has moved into the same position with OMSCO. He is widely experienced in drilling tools and equipment in general and has been associated with oilfield equipment for more than 14 years. Oilfield Machine and Supply Company manufactures drill collars, subs, wire line valves, kelly valves, well purgers, drilling control equipment, and other production and drilling items.

D. C. Ogden

● **Fred Clement,** region petroleum engineer at Denver, Colorado, for Continental Oil Company, has been made assistant manager, Denver region, production and drilling department.

**C. C. Frye,** region petroleum engineer, Ponca City, Oklahoma, has been promoted to region petroleum engineer, Denver, succeeding Clement.

**W. E. "Pete" Landrum,** division petroleum engineer, Oklahoma-Kansas division, Ponca City, advances to region petroleum engineer, Ponca City, succeeding Frye.

**Ed Nicholson,** division petroleum engineer, Wichita Falls, has been made division petroleum engineer, Ponca City, succeeding Landrum.

**V. E. Lewis,** district petroleum engineer, Panhandle district, Borger, Texas, moves up to division petroleum engineer, Wichita Falls, succeeding Nicholson.

**R. L. Adams,** petroleum engineer, West Texas district, Hobbs, New Mexico, is promoted to Panhandle district petroleum engineer, Borger, succeeding Lewis.

● **H. J. Olinger** has been appointed plant superintendent of Stanolind Oil and Gas Company's Luby natural gasoline plant at Bishop, Texas. Olinger was formerly an operating engineer in the company's general office in Tulsa.

● **J. A. McCutchin,** district manager for Sohio Petroleum Company in West Texas, has resigned to organize the McCutchin Drilling and Production Company with offices in the Wilkinson Building, Midland, Texas. McCutchin was manager for Sohio in Illinois-Indiana for the last three years and was chief petroleum engineer for the British American Oil Company, Tulsa, for eight years previously.

● **A. L. Henderson,** production division superintendent of The Ohio Oil Company, Houston, Texas, will be moved to Marshall to become manager of the Marshall production division. **G. F. Poe,** production division superintendent at Casper, Wyoming, will become superintendent of the Houston division. **O. V. Henry,** division superintendent at Grand Rapids, Michigan, will become superintendent of the Casper production division. **A. L. Burch,** division superintendent of the Tulsa, Oklahoma, division, will be transferred to Casper as special assistant to the division superintendent there. **E. B. Stewart,** district superintendent at Cement, Oklahoma, will become division superintendent of the Tulsa production division.

● **Robert Blake,** manager of the Chicago Office of Shand and Jurs Company, Berkeley, California, manufacturer of petroleum tank fittings, has returned to Chicago after completing a 10,000-mile tour of South America, studying at first hand the conditions affecting corrosion, and other problems pertaining to existing storage facilities. Blake spent six weeks in his research in all of the principal producing and refining centers, and capped off the results of his efforts with a detailed report that should redound to the benefit of the petroleum industry as a whole.

**Robert Blake**

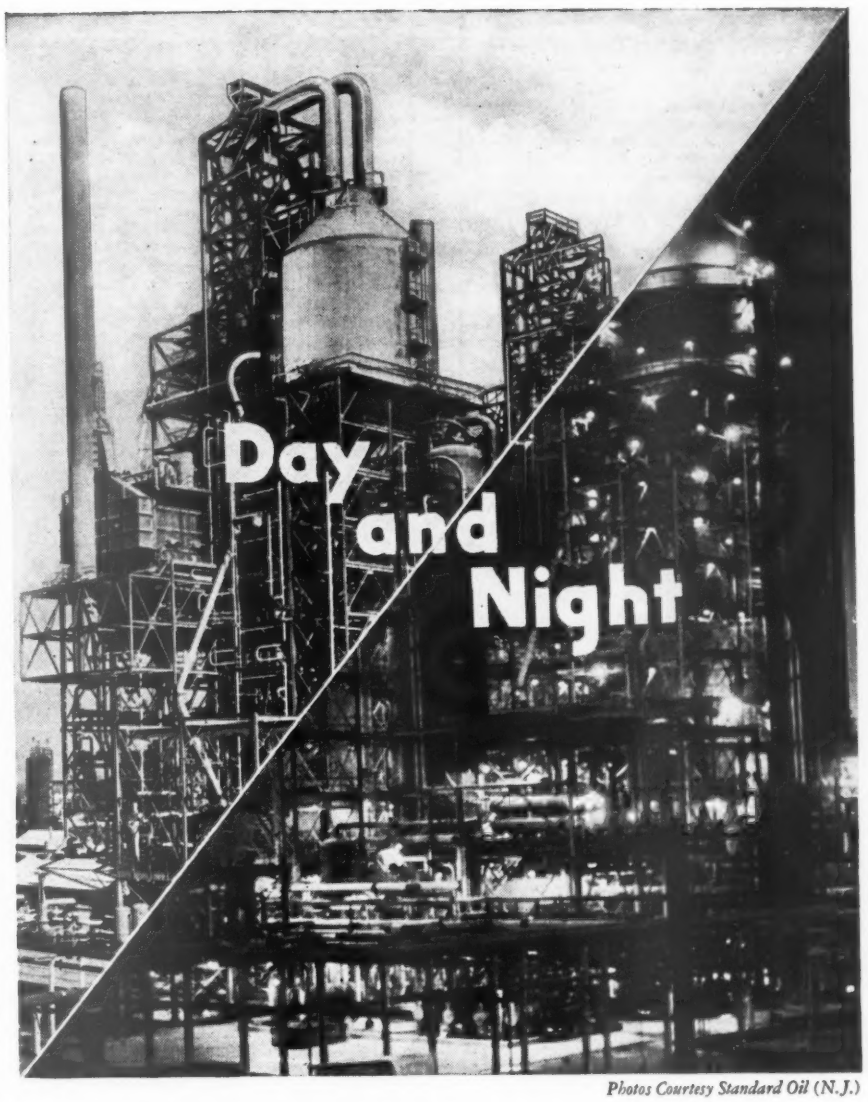
● **E. L. Adams** has retired as vice president and director of the pipe line department of General Petroleum Corporation, Los Angeles. **J. L. Martin,** general superintendent of the pipe line department since 1932, has been elected a director of the pipe line department and a director of the company to succeed Adams.

Adams, a 1908 graduate of the University of California, joined General Petroleum in 1912 as a civil engineer on pipe line construction. He became a director in 1932 and vice president in 1936.

Martin joined General Petroleum in 1913 as assistant superintendent of the pipe line department at Taft, after pipe line experience with other companies in Missouri, Illinois, Indiana, Oklahoma, and California. He has been general superintendent since 1932.

● **William Holbert** has been named to the new post of division drilling superintendent for Stanolind Oil and Gas Company. He will be responsible for Stanolind's drilling program in Oklahoma, Kansas, northern Louisiana, and Mississippi, and will have his headquarters in the division office at Oklahoma City. He was formerly district superintendent at Shreveport, Louisiana.

**C. J. Christensen,** formerly assistant division engineer at Fort Worth, Texas, is the new district superintendent at Shreveport.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**WANTED:** Chief Engineer capable of: taking charge, for engineering company, of design for two natural gas transmission lines, several hundred miles length, in Tennessee, including compressor stations, gauge, valve, regulator stations, etc.; also general supervision of construction for the proposed lines; headquarters in Tennessee. Must have wide experience in natural gas transmission pipe line industry. Graduate engineer preferred. Salary commensurate with ability and position requirements. Give all details in first letter as to age, education, experience, and photograph. This Chief Engineer to have similar position with operating gas company after completion of construction. Write Box 85, % *The Petroleum Engineer*, P. O. Box 1589, Dallas, Texas.

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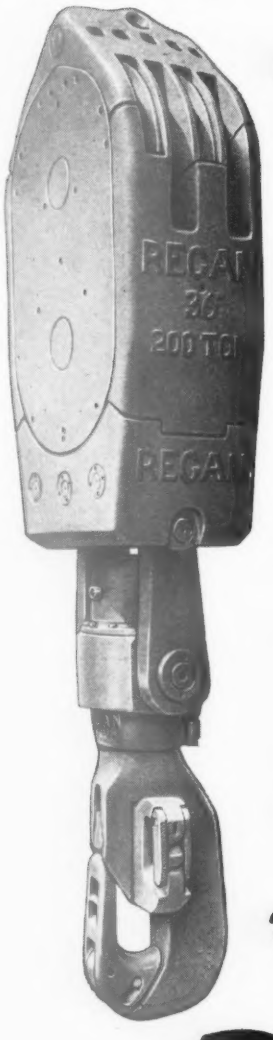

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EXCLUSIVE MID-CONTINENT REPRESENTATIVES:
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Hunt Export Company, 19 Rector Street, New York City, N. Y.
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**WANTED**
**CHEMICAL ENGINEER**

Excellent opportunity for a Chemical Engineer with five or more years' experience in the petroleum field. Must be capable of handling complete process calculations. Write giving full particulars including professional and character references and salary expected. A photograph should accompany the application. Position is permanent. Address Box 82, c/o THE PETROLEUM ENGINEER, P.O. Box 1589, Dallas, Texas.

**FOR SALE**
**DIESELS and PUMPS**

Six new 1947 unused 475 BHP 5 cylinder Baldwin Model VG Diesel Engines, four connected to Ingersoll-Rand Multi-stage Centrifugal Pumps with Farrel-Birmingham Step-up Gears and two connected to Worthington Horizontal Triplex Double Acting Pumps, all units complete with Falk Couplings, Lummus Coolers, other accessories. Location Ohio, immediate delivery. Direct inquiries to The Buckeye Pipe Line Company, Joseph Steele, Purchasing Agent, Room 2200, 30 Broad Street, New York 4, N. Y.

**DIESEL ENGINES**

Have two of the late model, 844 Buda Diesel Engines for sale. These engines are complete with electric starting system, radiator, clutch and power takeoff on one and torque convertor on the other. Engines in good shape. Wire, write or call Stewart & Stevenson Services, 4801 Lemmon Avenue, Dallas, Texas. Phone Logan 6-6649.

## Hopkins promoted

Consolidation of the Los Angeles Basin and Coastal districts under the managership of John Hopkins is announced by Kobe, Inc. Hopkins, who joined Kobe in 1946, after wartime service in the U. S. Navy, has been Coastal District representative for the past year. The headquarters of the combined districts will be in the Wilson Building, Huntington Park.

John Hopkins

Hopkins will be assisted by Howard Sweet, who, until recently, has been a member of Kobe's technical service division.

## Johnston Enterprises

M. O. Johnston, prominent California oil tool manufacturer of Los Angeles, and a pioneer of gun perforation, has joined forces with Edgar Johnston of Longview, Texas, oil operator and contractor, in the formation of the Johnston Enterprises, a Johnston family business that links Mid-Continent and California interests. M. O. Johnston is president, Blaine Johnston is general manager, and the other owners are M. O. Johnston, Jr., Warren Johnston, E. C. Johnston, Jr., Gordon Johnston, and Glenn Johnston.

Johnston Enterprises controls the patents and manufacturing rights of the new Hydra-Line principle. This revolutionary new development departs from conventional means of hoisting operations by combining hydraulics with the wire line. The company headquarters is at 3035 Andrita Street, Los Angeles, and the manufacturing plant is at Longview, Texas. The Hydra-Line Division, with headquarters at 3035 Andrita Street, Los Angeles, has been formed for the purpose of making Hydra-Line applications for the oil industry. Their first product is the Mason Hydra-Line Rig, which eliminates drawworks and traveling blocks on heavy duty deep well drilling rigs, fully portable and semi-portable drilling and workover rigs, light portable pulling and shallow drilling rigs, pumping and pulling units.

Blaine Johnston, Jr., is also general manager of the Hydra-Line Division.

## Corrosion problems

Sam T. Shultz, Port Arthur, Texas, has been placed in charge of the corrosion engineering department of The Natasco Company, Tulsa, Oklahoma. Shultz was associated with The Texas Company refinery at Port Arthur as paint chemist for a period of 17 years and prior to that was with the du Pont Company. He has specialized in corrosion problems and organic protective coatings and has conducted tests in the field as well as laboratory studies. Shultz will establish headquarters in Houston.

## Egloff named

Dr. Gustav Egloff, director of research, Universal Oil Products Company, has been reelected president of the Chicago Technical Societies Council. Other officers for the 1948-1949 term are: Dr. Clyde A. Crowley, executive vice-president; Lewis A. Bain, Robert H. Bacon, Dr. Herman S. Bloch, and Paul S. Smith, vice presidents; R. T. Van Niman, corresponding secretary; William Kucinski, recording secretary, and Frederic E. Oakhill, treasurer.

New directors are: Dr. Johan A. Bjorksten, W. Fred Dolke, and Clarence M. Sieben. Incumbent directors are: Kenneth H. Hobbie, John E. Ott, Jean O. Reinecke, and Dr. H. A. Wagner.

The Chicago Technical Societies Council is a federation of 53 professional societies with a combined membership of 20,000 scientists, engineers, and technologists in the Chicago area.

## Joins Waldrip

O. C. Slavens has joined the sales force of Waldrip Engineering Company, Hollydale, California, to handle sales of Waldrip hoists and Waldrip air-balanced pumping units, according to an announcement by William S. Sprague, president. Slavens has had wide experience in the production equipment field, having spent ten years, 1934 to 1944, with The Lacy Oil Tool Company. Prior to joining the staff of Waldrip Engineering, Slavens was associated with the Baroid Sales Division specialties department from 1944 to May of this year.

O. C. Slavens

## World's largest oil line pumps to go to Arabia

Two 14 x 16 2-stage Byron Jackson pipe line pumps will soon be delivered to the Arabian American Oil Company for the first station on the Trans-Arabian pipe line. One unit will handle the entire capacity of the line; the other is a spare.

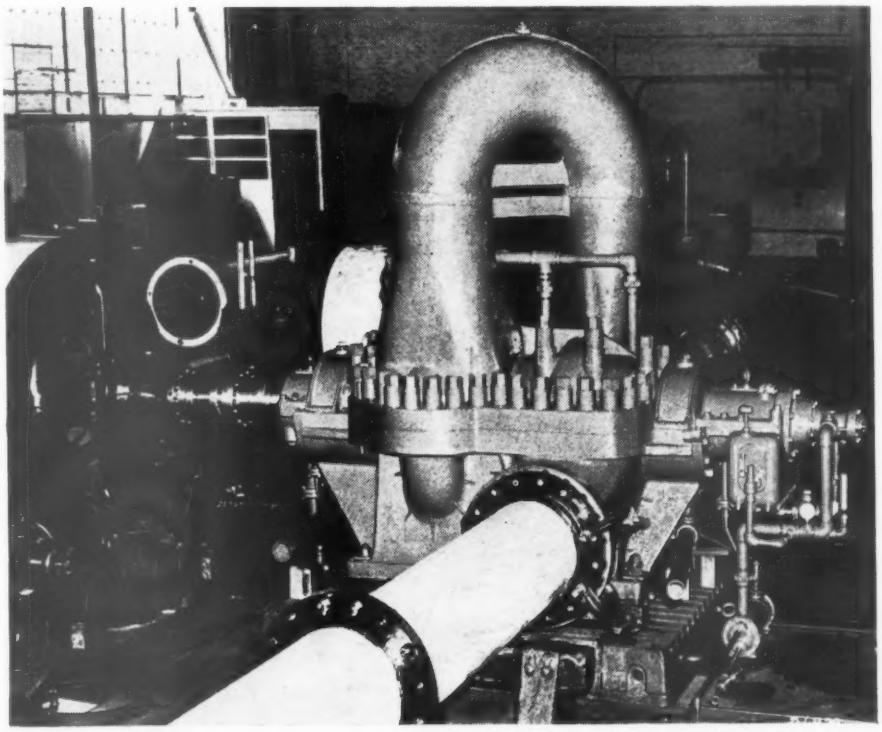
These pumps, operated at 3600 rpm by 6000-hp steam turbines, will start crude through the 1050-mile Trans-Arabian pipe line. Each pump is designed to handle 400.000 bbl per day against a pressure of 800 psi.

The pump casing is of cast steel, tested to 1300 psi. The impellers and shaft sleeves are of stainless steel. Both stages are double suction with double volutes.

Packing problems, always serious where large diameter sleeves rotate at high speeds, are eliminated by the simplest means—no packing. At both ends of the unit, throttle bushings on mirror-finish sleeves provide a seal and reduce pressure to atmospheric. A small leakage through this bushing type is collected and pumped back into the line.

At five subsequent stations along the line, four BJ single stage pumps in series, driven through gears by giant diesel engines, do the same job as one of these units operating alone. A fifth unit serves as a spare.

An idea of the size of the operation may be illustrated by the fact that all six stations, using a total of some 36,000 hp, must operate at full capacity for nearly two weeks just to fill the line.



# CRUDE, CRACKED AND VOLATILE

"Poor man! He was ruined by untold wealth."

"Untold wealth?"

"Yes, he didn't tell about it on his income tax."

* * *

*Luke:* . . . and then everything went black.

*Jake:* Why?

*Luke:* She hung something on the knob.

* * *

*Elderly Patient:* As we have known each other so long, doctor, I do not wish to insult you by paying my bill. I will leave you a handsome legacy in my will.

*Doctor:* That's very kind of you, I'm sure. By the way, just let me have that prescription again. There's a slight change I want to make in it.

* * *

"Gracie, I think your husband dresses nattily."

"Why the rat! Who's Natalie?"

* * *

A Texan was visiting the East, where he had occasion to attend the funeral of a man who was thoroughly disliked in the community.

At the services the minister, who was new in the parish, called upon someone to say a few words about the deceased. A long and significant silence ensued.

Finally, the true son of Texas arose and said: "Well, since there is no one present who has anything to say about our departed brother, I'd like a few minutes to tell you folks about Texas."

"What has more fun than people?"

"Rabbits."

"Why?"

"Because there are more rabbits than people."

"Why?"

"Because rabbits have more fun than people."

* * *

"Won't you join me in a cup of coffee?"

"You get in first."

* * *

*Mistress:* Marie, when you wait on my guests at the table tonight, please don't spill anything.

*Maid:* Don't you worry, ma'am; I never talk much.

* * *

A tramp knocked on the door of the inn known as "George and the Dragon." The landlady opened the door and the tramp asked, "Could you spare a hungry man a bite to eat?"

"No!" replied the landlady, slamming the door in his face.

A few minutes later the tramp knocked again. The landlady came to the door again. This time the tramp asked, "Could I have a few words with George?"

* * *

The Washington Biological Survey which puts metal bands on wild birds to study their migratory habits, recently ordered new bands with different wording. They now read: "Notify fish and wildlife services, Washington, D. C." Formerly the bands said simply "Wash. Biol. Surv." Unofficial explanation of the change: An irate taxpayer's letter complained, "Sirs: I shot one of your pet crows and followed instructions. I washed it, I boiled it, and I served it. It was terrible. Stop fooling the people!"

* * *

"About this girl you want to marry: has she good connections?" asked a proud mother.

"Well, she never came apart when I was with her," replied the sailor.

* * *

The noblest of all animals is the dog and the noblest of all dogs is the hot-dog. It feeds the hand that bites it.

* * *

A newspaper got a call from a driller's wife who wanted her spouse's name put in the obituary column, because she caught him kissing his secretary.

"How long has he been dead?" she was asked.

"He starts tomorrow."

* * *

*She:* My, what slim, expressive hands you have. They belong on a girl.

*He:* Well, I never pass up an opportunity.

* * *

The young steno was being given her first instructions by the boss man.

"There are two words that I never want to hear you use around here," he said. "One is lousy and the other terrific."

"OK," replied the gal. "What are the words?"

* * *

"You were brought in here for drinking," lectured the police sergeant.

"Thash mighty fine, Sarg," replied the culprit. "Let's get started."

* * *

We know a guy who is so tight he won't buy his girl a beach umbrella when they lie on the sand. He tells her shady stories instead.

* * *

"Well, waiter, that was a tip-top dinner. You know what that means, don't you?"

"Yes, sah—it's one dat you top off with a tip."

* * *

"How come you go steady with Helen?"

"Well, she's different from the other girls."

"How is that?"

"She's the only girl who'll go with me."

* * *

"Did you get home all right after the party last night?

"Fine, thanks, except that as I was turning into my street some idiot stepped on my fingers."

* * *

"I just dropped in to tell you how much I benefited from your treatments," said the young man.

"You're no patient of mine," said the doctor, eyeing him sourly.

"No, but my uncle was."

# FOR CEMENTING SUCCESS

## Use the BAKER Cement Wash-Down *Whirler* Float Shoe

(Product No. 120)

**A SEAMLESS STEEL SHOE** in which a strong concrete plug and plastic valve assembly are securely anchored.

**ACCURATELY CUT THREADS** to fit any style casing.

**A PLASTIC BALL VALVE** to seal instantly against a resilient valve seat.

**BAKER-FORMULA CONCRETE** and *granular* plastic; easily drillable.

**WASH-DOWN *Whirler* PORTS** whirl cement slurry to provide uniform encirclement of casing with cement.

**AMPLE CIRCULATING PASSAGEWAYS** for hole conditioning and cementing.

Whirling action, plus jetting action, removes bridges and conditions the hole.

Whirling action reduces hazards of channeling.

YOU WILL FIND *ALL* THESE FEATURES *ONLY* IN THE

# BAKER

## CEMENT WASH-DOWN *Whirler* FLOAT SHOE

## New National Supply Bakersfield plant

Recent completion of a new, ultra-modern store and warehouse at Bakersfield, California, which triples its former capacity, was announced by The National Supply Company with an open house to which more than 2000 oil producers in the district were invited. This expansion, reflecting continued confidence in the future of the field, is the latest of several that have been required during nearly 50 years of operation in Bakersfield.

The new Bakersfield store is one of the largest and most complete of its type in the United States, according to J. L. Philipp, district manager at Bakersfield. Its opening was arranged to give district oil men an opportunity to acquaint themselves with the new and improved facilities and to see a specially arranged display of drilling and producing equipment manufactured by National Supply Company, and several other suppliers' products that are handled through National's nearly 100 stores throughout the United States.

D. S. Faulkner, vice president in charge of the California division, Torrance, California, was present to welcome guests. Among many other National Supply executives present were J. R. Mahan, director of engineering, Toledo, F. J. Young, chief engineer, Torrance, C. T. Reichert, division sales manager for the oil field machinery and equipment division, Torrance, L. L. Livesley, regional manager for the Superior Engine division, and W. W. Giles, district manager for the Spang-Chalfant division.

## E. A. Wert promoted

The Ric-wiL Company of Cleveland, manufacturers of insulated pipe conduit systems, announces the appointment of Edwin A. Wert as vice president in charge of engineering. Wert is nationally known for his work on piping design and for his several published books on the subject. He is a member of the American Society of Mechanical Engineers and an alumnus of the University of California.

E. A. Wert

## R. F. Roberts transferred

R. F. Roberts, who for a number of years was division manager of the Reed Roller Bit Company at Shreveport, Louisiana, has been transferred to Caracas, Venezuela. Roberts' new territory includes Venezuela, Colombia, Ecuador, Peru, and Trinidad. He replaces T. C. Lemcke, who is returning to the States.

R. F. Roberts

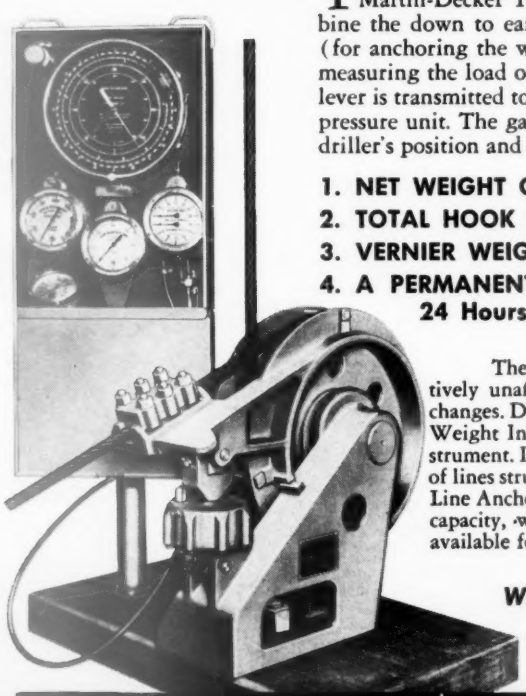

# Rely on this NEW combination

FOR
*Accurate, Sensitive, Convenient*
**DRILLING CONTROL**

**MARTIN-DECKER**
**Type "D"**
**WEIGHT INDICATOR**

AND
*Simple, Safe, Efficient*
**WIRE LINE ANCHORING**

*National* IDEAL
**Type "D"**
**WIRE LINE ANCHOR**



THE IDEAL Type "D" Wire Line Anchor and the Martin-Decker Type "D" Weight Indicator combine the down to earth principles of (1) the wheel (for anchoring the wire line) and (2) the lever for measuring the load on the wire line. The force of the lever is transmitted to the gauge through the hydraulic pressure unit. The gauge, of course, is installed at the driller's position and gives him:

1. **NET WEIGHT ON BIT**
2. **TOTAL HOOK LOAD Directly In Pounds**
3. **VERNIER WEIGHT INDICATOR**
4. **A PERMANENT INKED RECORD Of Each 24 Hours Operation**

The Type "D" Weight Indicator is positively unaffected by atmospheric temperature changes. Dead Line Whip can neither affect the Weight Indicator reading nor damage the instrument. It requires no adjustment for number of lines strung or cable diameter. A larger Wire Line Anchor, the Type "E," having greater load capacity, with appropriate instrumentation is available for 1⅜" and 1½" wire line.

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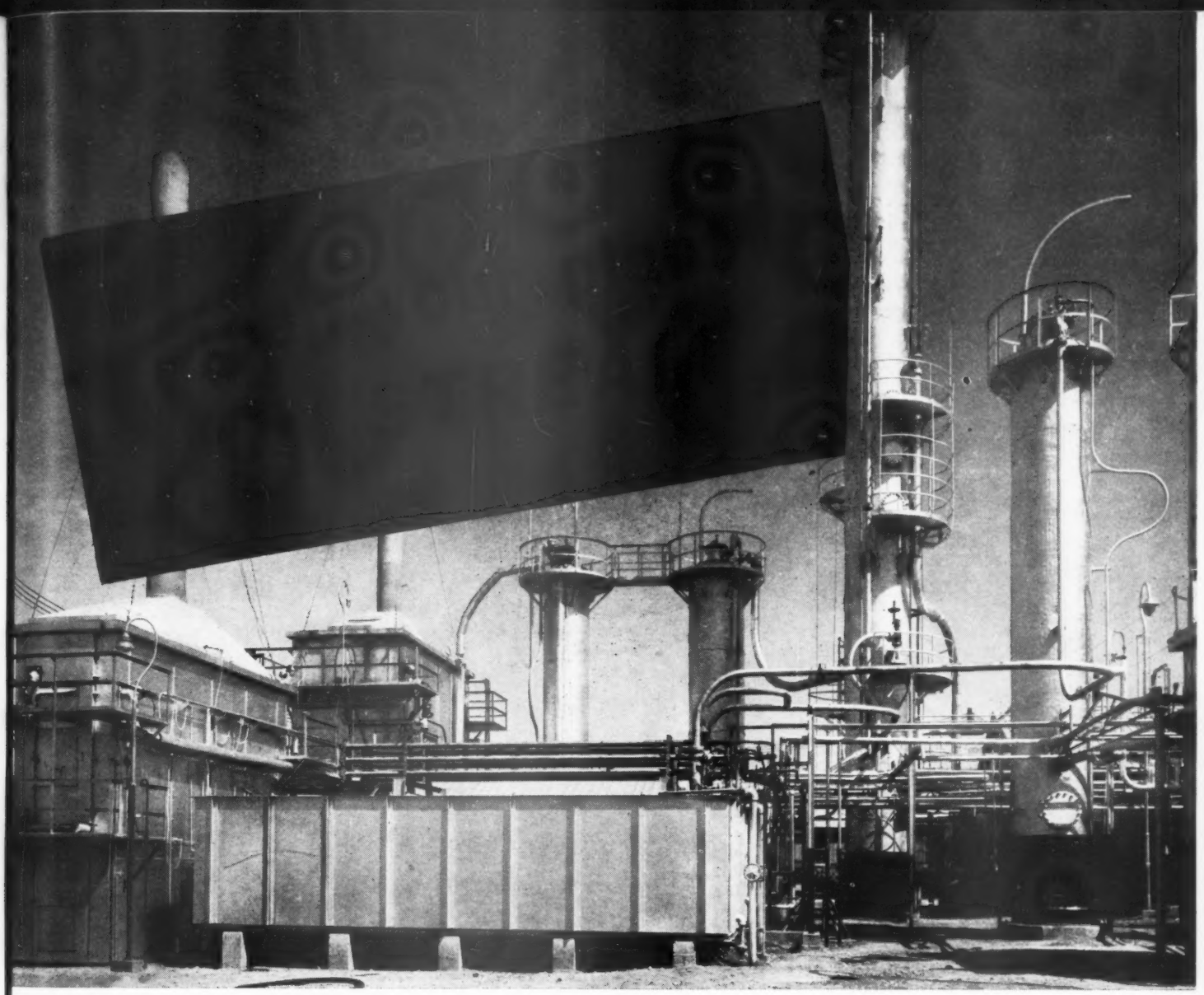
MID-CONTINENT DISTRIBUTOR:
REED ROLLER BIT COMPANY, HOUSTON, TEXAS



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UNITED STATES STEEL

# "OILWELL"

## Pipe line head

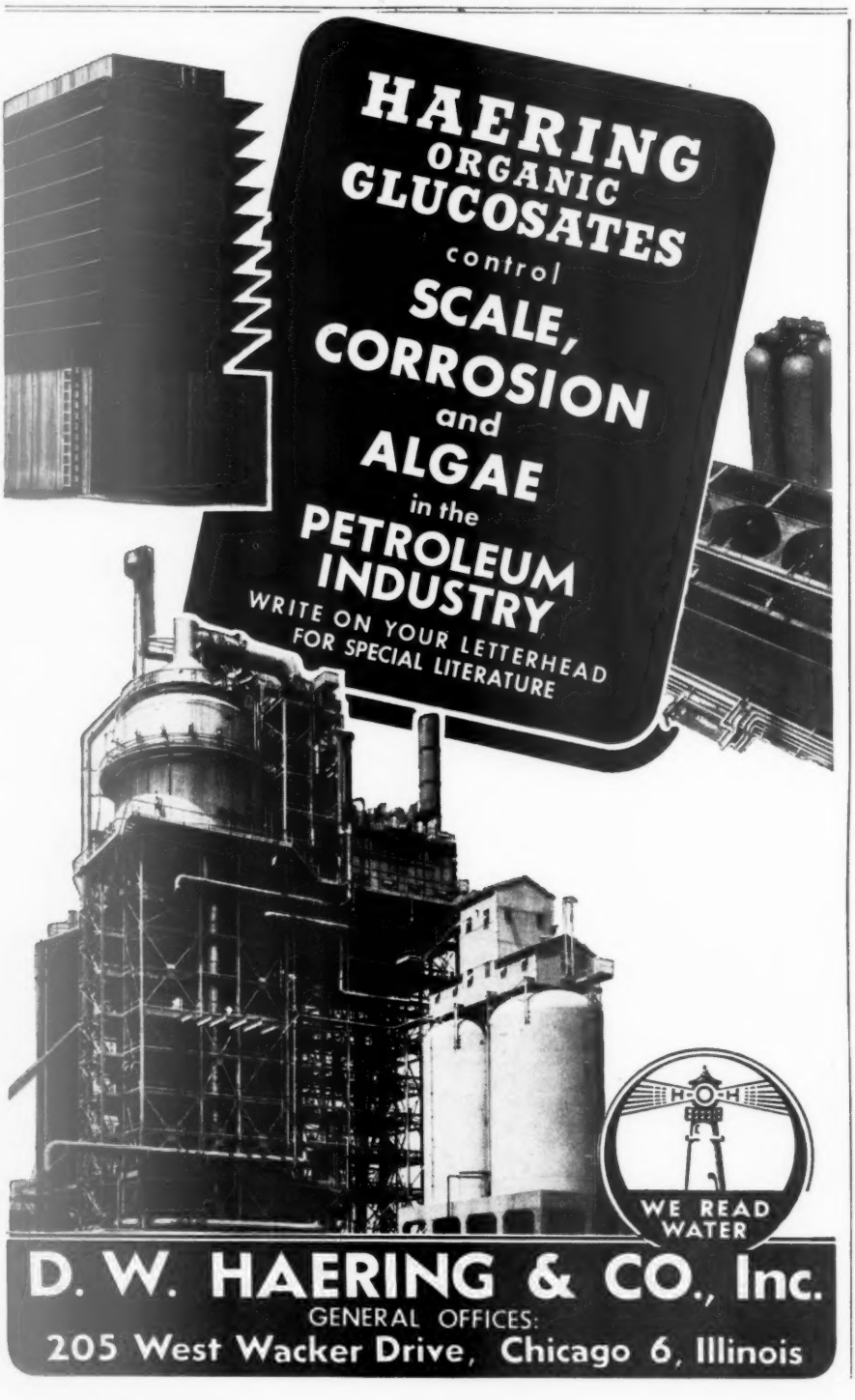
The board of directors of Stanolind Pipe Line Company announces the election of J. L. Burke, executive vice president, to become president of the company, succeeding B. C. Clardy, resigned.

Burke gained his first business experience with the Frisco Railroad in Springfield. He left the railroad to join the traffic department of Sinclair Oil and Gas Company in 1920. In 1924, he was made traffic manager of Sinclair Pipe Line Company and continued in the same capacity when it became Stanolind Pipe Line Company in 1930.

In 1945 he became a member of the board of directors of Stanolind Pipe Line Company, and was elected vice president in charge of traffic in 1946. In 1947, he was elected vice president, and became executive vice president in January, 1948.

It is also announced that J. R. Polston has been elected a director of the company. Polston joined the company on October 1, 1922, as a draftsman, when it was known as Sinclair Pipe Line Company. He resigned March 15, 1926, to accept employment as construction superintendent with the Marland Oil Company at Ponca City, left Marland January 15, 1929, to work for the Arthur G. McKee and Company, as refinery process design and estimating engineer. On May 1, 1934, he returned to Stanolind Pipe Line Company as mechanical engineer, which position he held until July 1, 1946, when he became assistant chief engineer. One month later he was made chief engineer, and on December 1, 1947, was promoted to assistant general manager in charge of engineering and construction.

R. J. Andress, recently elected a director of Stanolind Pipe Line Company, has been executive vice president.



## Mississippi manager

Appointment of Hearn J. Paschall as division manager of Mississippi for the H. C. Smith Oil Tool Company, has been announced by Ronald C. Smith, general sales manager. The company's headquarters will be at 709 Orleans Street, Natchez, Mississippi. Paschall has been associated with the H. C. Smith Oil Tool Company for the last 10 years and until recently was the company's branch manager in Santa Maria, California. A few months ago, Paschall made an extensive tour of the various oil fields throughout the Middle East in the interest of his firm.

H. J. Paschall

## Kobe makes change

M. E. Hamilton of Kobe, Inc., who has been in the East Texas district for the last 2½ years, has been assigned to Louisiana, and Mississippi, operating out of the company's new office at Natchez, Mississippi. He first joined Kobe, Inc., as a field engineer in 1941, after receiving a B.S. degree from the University of Oklahoma. During the war he served as an officer in the U. S. Navy, specializing in radar. He rejoined Kobe in November, 1945.

M. E. Hamilton

## Jack Worthington retires

J. T. "Jack" Worthington, general field superintendent for the California division of the Petroleum Rectifying Company of California, has retired. Jack has seen more than 40 years of oil industry activity, mainly in construction and electric dehydration. Since his employment with Petreco, Worthington has supervised the installation of electric dehydrating plants throughout the oil fields, from Texas to California. During recent years, his activities have been concentrated in California, in the Los Angeles Basin particularly.

J. T. Worthington

## Advertising manager

Appointment of W. E. Largey as advertising manager of the Oil Tool Division has been announced by Byron Jackson Co., Los Angeles, California.

W. E. Largey

He assumed his responsibility following the International Oil Exposition at Tulsa. Largey will continue as advertising manager at Patterson - Ballagh, division of Byron Jackson Co. He has worked in the California oil fields and in advertising since 1939, having been associated with the Continental Oil Company, Continental Advertising Agency, and Emsco Derrick and Equipment Company, joining Patterson-Ballagh in July, 1947.

C. W. Smick of the Pump Division, Byron Jackson Co., will continue as advertising manager of that division.

## Makes new connection

B. E. Groenewold, in charge of drilling equipment and engineering sales for the Bethlehem Supply Company since 1940, has resigned to accept appointment as chief engineer and assistant to the manager for the Exploration Drilling Company, Tulsa.

B. E. Groenewold

Groenewold was with the National Supply Company for 14 years before going with Bethlehem, serving in the engineering and sales division in Oklahoma and Texas. He is a graduate of the Massachusetts Institute of Technology.

## European representative

M. J. Galpin of London, England, has been appointed European representative for Clark Bros. Co., Inc., of Olean, New York, and the International Derrick and Equipment Company of Columbus, Ohio, and Dallas, Texas. Galpin spent several weeks in the United States recently preparatory to assuming his duties abroad. Before joining the above two organizations, Galpin was with the Anglo-Iranian Oil Company for nine years and six years with the Roumanian Oil Industry. In the late war he served with the British Army from 1940 to 1946 as a lieutenant-colonel. He is a graduate of Trinity College, Oxford University.

M. J. Galpin

The new HELICOID VACUUM GAGE gives the user several advantages at no extra cost.

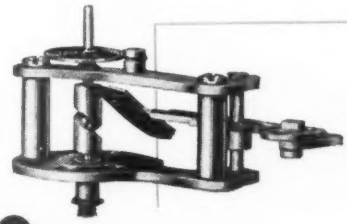
The pointer may be reset externally for changes in barometric pressure. This assures correct readings regardless of changes in room pressure.

The sub-divisions on the dial are in graduated steps of 0.2 inches. This makes the dial easy to read.

The dial graduations run counter-clockwise to denote negative pressure. This identifies the gage as a vacuum gage.

The special, phosphor bronze Bourdon tube has 300% greater torque. This assures more positive and precise response to slight changes in pressure, and results in accuracy to within 15/100ths of an inch.

HELICOID is first in new features — first in quality — first in durability — first in accuracy.



*Only Helicoid Pressure Gages have the Helicoid Movement*

ACCO

HELICOID GAGE DIVISION
AMERICAN CHAIN & CABLE
Bridgeport 2, Connecticut

TRADE MARK

## Sales representatives

The France Packing Company announces the appointment of the Thilenius Equipment Company, 303 East Fourth Street, Tulsa, Oklahoma; and George A. Krutilek, 1125 Texas Street, El Paso, Texas, as sales representatives.

The France Packing Company is well known throughout industry as manufacturers of metal packing, valve plates, and piston rings, with special application in refineries, chemical plants, pipe line stations, and cycling plants. The local sales offices will carry a stock of popular size packing rings in cast iron, bronze, and carbon-bakelite, compressor plate valves and segmental piston rings.

## New district office

The Marley Company, Inc., manufacturers of cooling towers, water cooling equipment, and spray nozzles, announces the opening of a new district office in Philadelphia at 1112 Packard Building. Robert M. Sharp is in charge.

Sharp recently completed a five-months' intensive training program at the home office in Kansas City in preparation for his new appointment. A native of New Jersey, Sharp has been associated with cooling tower manufacturers several years. He received his B. S. in electrical engineering from Rutgers University, and his M. S. in chemical engineering from New York University.

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## Ideco personnel changes

Richard R. Bloss, vice president and general manager of International Derrick and Equipment Company, Texas Division, Beaumont, Texas, announces three promotions from within the ranks.

W. O. Cook

Wm. O. "Bill" Cook has been promoted to assistant general manager of the Texas Division. Bill has been chief engineer since 1938. He was born in Maquota, Iowa, and moved with his family to Beaumont in 1915. He received his B. S. in mechanical engineering from Rice Institute in 1934, and immediately thereafter joined the engineering staff of Ideco at Beaumont.

A. R. McLerren has been promoted from the position of assistant chief engineer to that of chief engineer of the Texas Division. McLerran received his B. S. in mechanical engineering from the Agricultural and Mechanical College of Texas in June, 1939. Mac joined the Ideco organization at Beaumont, immediately after graduating from college.

A. R. McLerran

M. E. Horn

M. E. "Trader" Horn has been associated with the oil industry for more than 22 years and is well known in the drilling circles of most oil fields in the U. S. He has been servicing drilling equipment for the last 20 years and has been field service engineer for Ideco since September, 1944. "Trader" has been moved to Beaumont, where he will be in charge of field service for the Beaumont plant of Ideco, under the supervision of the Dallas department.

## M. F. Jones promoted

Lloyd E. Tracy, vice president-sales for Oil Well Supply Company, has announced the appointment of Melvin F. Jones as general sales staff manager for this U. S. Steel subsidiary, whose headquarters are at Dallas, Texas.

Jones, "Oilwell's" assistant treasurer for the last 5½ years, began his service with the company in 1929, and was with the accounting department at Pittsburgh and Oil City, Pennsylvania, until 1935 when he was transferred to the accounting department at the Dallas headquarters. In 1939, he moved to Los Angeles as division auditor for the California division and returned to Dallas as assistant treasurer in January, 1943.

## Ayers to Bovaird

Roscoe G. Ayers, general manager of sales of Bethlehem Supply Company, and widely known figure in the oil well supply business for many years, became vice president and general manager of sales of Bovaird Supply Company July 1, according to an announcement by W. M. Bovaird, president of the Tulsa, Oklahoma, firm.

R. G. Ayers

Ayers has had a long and active career in the oil business. Following his overseas service in the U. S. Navy during World War I, the Tulsa executive joined the engineering sales department of Link-Belt Company in 1918. In 1920 he joined Clark Bros. Co. at Tulsa, exploiting the sales of Clark drilling engines. He transferred to the National Supply Company in 1922.

Promoted by National Supply through several years, Ayers served as division engineer, 1927 to 1936, and assistant division sales manager during 1937 and 1938, when he became general manager of sales of Bethlehem Supply Company.

Ayers succeeds D. M. Bradley who became vice president of the Big Chief Western Drilling Corporation at Denver.

## Development engineer

M. T. Works, chief engineer of Cameron Iron Works, Houston, Texas, has announced the appointment of G. E. Nevill to the position of senior development engineer. Nevill, a native of Houston, received his engineering degree from Rice in 1928, and has held engineering positions with a number of prominent oil tool manufacturers, including Beaumont Iron Works and National Supply Company. He resigned his position on the engineering staff of Brown Shipbuilding Company to accept his new position with Cameron.

G. E. Nevill

## New Fluor office

Harold S. Armstrong, district engineer, is now heading The Fluor Corporation, Ltd.'s, new district sales office, situated in the Underwood Building, San Francisco, California. The territory covered by this office ranges from San Francisco north through California, Oregon, and Washington. The opening date was June 15.

H. S. Armstrong

Hook up a Troy-Engberg Steam Engine to a pump, compressor or blower and you can rest assured it will drive the unit without faltering throughout any run you schedule.

Troy-Engberg Steam Engines are dependable.

They have the conservative though flexible speed that is needed for so many drives. They have the high starting torque and high sustained overload capacity. And units for refineries can be obtained with spark-proof and explosion-proof construction.

Write us direct about your requirements or have the manufacturer from whom you are buying your equipment investigate the Troy-Engberg Engines for the drives.

**TROY ENGINE & MACHINE COMPANY**

*Established 1870*

1900 RAILROAD AVENUE • TROY, PENNSYLVANIA

*Bulletin No. 306 will give you information on the Troy-Engberg Steam Engine. Shall we send you a copy?*

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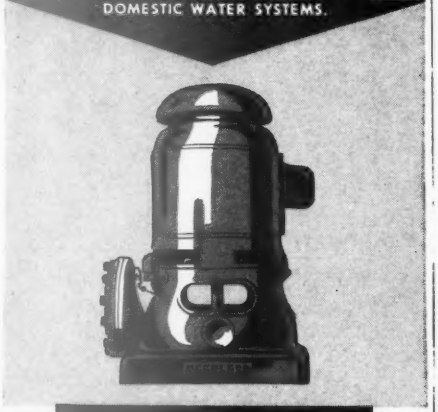

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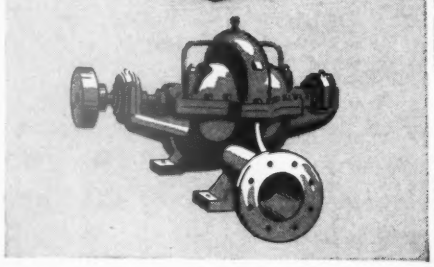

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## Link-Belt plant

Link-Belt Company announces that it has given Vivrett and Vivrett the contract for the construction of a modern new plant on a 10-acre plot of ground in the 5100 block of Wayside Drive in Houston, Texas. J. A. Pitzinger is the architect and engineer for the new plant.

Included in the project will be a one-story, all-steel factory building with three bays, and a two-story office section of masonry construction in front. The plant proper will include a modern machine shop, structural steel shop and large warehousing facilities.

"We have long felt the need for this new and larger plant in the Southwest," said Edward J. Burnell, vice president and general sales manager of Link-Belt Company, "in order to meet the constantly increasing demand for our conveyors, dryers, screens, power transmission machinery, by the oil well drilling industry; cotton oil mills; carbon black plants; sugar, flour, rice and paper mills; chemical plants; quarries; and the many other types of factories."

## Long-stroke pump

Axelson Manufacturing Company is now setting up an organization to handle sales and service in Mid-Continent fields for the Axelson long-stroke hydraulic pumping unit. These units are expected to aid materially in the economic pumping of wells as deep as 12,000 ft.

Although this hydraulic pumping unit, formerly known as the Vernon-Suter pump jack, has been used in California for eight years, this first installation in a Mid-Continent field will be in West Texas where Stanolind Oil and Gas Company is installing one on an 8500 ft well.

Stanolind is actively engaged in drilling for deep oil production and the problem of producing crude from these depths economically is being systematically attacked by Stanolind's engineers and production men.

The long stroke of the Axelson unit (26½ ft) results in greater bottom hole pump efficiency because it minimizes the effect of rod stretch, according to the manufacturer. The unit maintains production with fewer cycles per minute, thus reducing wear on pump parts and rods, it is also asserted; and sucker rod failures have virtually been eliminated on wells pumped by this unit because shock loading is reduced.

## McKinney heads PESA

A. W. McKinney, vice president of the National Supply Company, was elected president of the Petroleum Equipment Suppliers Association at the annual meeting held in Colorado Springs, Colorado. W. M. Bovaird, president, Bovaird Supply Company, Tulsa, was chosen vice president, Wharton Weems, Houston, general counsel, and H. R. Safford, Houston, executive secretary. Forty-eight directors, 12 from each of four districts, also were named.

The next annual meeting of the association will be in May of next year at the Greenbrier Hotel, White Sulphur Springs, West Virginia.

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Hotel Edson ..... Beaumont
Hotel Brownwood ..... Brownwood
Hotel Sanger ..... Dallas
Hotel Cortez ..... El Paso
Hotel Texas ..... Fort Worth
Hotel Buccaneer ..... Galveston
Hotel Galvez ..... Galveston
Hotel Jean Lafitte ..... Galveston
Coronado Courts ..... Galveston
Jack Tar Court Hotel ..... Galveston
Miramar Court ..... Galveston
Hotel Cavalier ..... Galveston
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## M. S. Cloyd to fill bank post

Marshall S. Cloyd, assistant vice president, has been made advertising and public relations director of the First National Bank in Dallas. He succeeds Jordan C. Ownby whose resignation due to ill health was announced May 29.

M. S. Cloyd

Cloyd attended Southern Methodist University and Massachusetts Institute of Technology, graduating from SMU in 1934. He later attended Harvard Graduate School of Business Administration. From 1937 until 1942 he was associated with a firm of Dallas investment bankers as manager of the U. S. Government Bond Department.

Cloyd entered the Army Air Forces in 1942, and upon relief from active duty in September, 1945, held the rank of major. Shortly after returning to civilian life, Cloyd became associated with Jonas S. Touchstone in the firm of Touchstone-Cloyd & Associates, life insurance brokers. He joined the First National Bank in November, 1947.

## Tompson heads Bethlehem Supply

A. B. Homer, president, Bethlehem Steel Corporation, has announced several executive appointments in Bethlehem's oil field subsidiary, Bethlehem Supply Company, with headquarters at Tulsa, Oklahoma.

G. A. Tompson, vice president of Bethlehem Supply Company, becomes president.

C. R. Zimmerman, assistant to the vice president, sales department, Bethlehem Steel Company, has been made executive vice president of Bethlehem Supply.

J. F. Eaton, manager of the plant at Tulsa, has been named vice president in charge of manufacturing.

I. C. Smith, manager of the Corsicana plant, has been appointed general manager of sales.

Tompson is a native of Missouri, and attended the University of Missouri. His entire business career has been spent in the oil industry. Before joining Bethlehem Supply Company he had been with Cities Service Oil Company for 20 years; during the last 12 years of that period he was purchasing agent. He has been an executive of Bethlehem Supply Company since its formation in 1937, serving first as vice president in charge of sales and later becoming vice president and general manager.

Zimmerman, a native of Baltimore, entered the employ of Bethlehem Steel Company in 1927 at the Sparrows Point plant. After serving as assistant chief inspector in the pipe mills, in 1938 he was transferred to the sales department at Bethlehem, Pennsylvania. In 1947 he was appointed assistant to vice president, sales department.

Eaton was born in Kansas City. He was graduated from Princeton University in 1931, and following a brief period with the Aluminum Company of America was employed by Jarecki Manufacturing Company. He was subsequently with American Steel Derrick Company, returning later to the Jarecki company as district manager of sales at Houston. In 1939 he joined Bethlehem Supply Company as chief engineer of the Tulsa plant, becoming plant general manager in 1940.

Smith entered the employ of Bethlehem Steel Company as a member of the 1935 Loop Course following his graduation from Lehigh University. On completion of the loop he was assigned to the Bethlehem plant and after filling several positions in the machine shops, and forge and treatment departments, he became supervisor of production control of the manufacturing division, and later superintendent of No. 4 and No. 5 forge departments. In 1945 he was appointed manager of the Corsicana plant.

## To handle MacClatchie products

In order to facilitate sales and services throughout the Rocky Mountain area, MacClatchie Manufacturing Company has appointed the T-P Tool Company with headquarters in Cody, Wyoming, to handle the complete line of MacClatchie products, according to an announcement made by J. Warren MacClatchie. The sales organization of T-P Tool Company will service the entire area and, in addition to its main headquarters, a branch warehouse is maintained in Littleton, Colorado.


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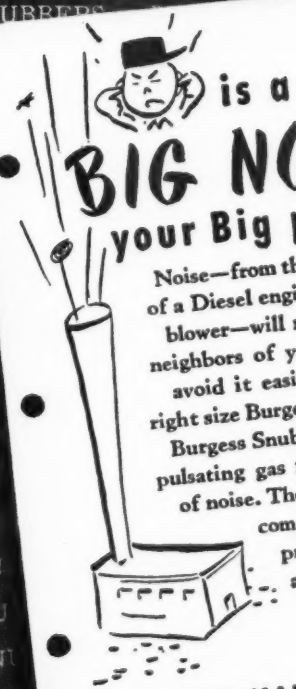

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# Petrolic Personalities

By DICK SNEDDON

It is a bit late to be talking about it perhaps, but in all the history of human association there has never been a more interesting concourse than that which assembled in Tulsa, Oklahoma, for the International Petroleum Exposition. As nearly as we have been able to determine with the help of an electric abacus, the number of persons who paid admission was 300,000. Before the party was over, 200,000 of them had sore feet and the remainder could scarcely groan above a whimper. Although it was hot for the first few days and the pavement was exceedingly hard, the exhibits were so good that the delegates continued to pad around until their metatarsals pained abominably and the air was lush with the thud of falling arches. Also, in striving to talk above the hum of racing engines and the raucous toots of sundry horns and whistles, many an exhibitor overexercised his tonsils and transmuted his voice to an asthmatic wheeze. Completely exhausted, we personally dropped into International House one afternoon, slumped in a chair, and said to the fellow in the adjoining seat, "I'm almost sick from aching feet." In a foreign accent he replied, "How do you do—I am Pietro Cantenza from Costa Rico."

It will be at once obvious that this is not a dissertation on equipment items and displays. It would take a whole volume to describe the wonderful exhibits of which the IPE was composed and we are not going to try it. This blurb is strictly about people. In our peregrinations we met many visitors from all parts of the country, from all parts of the world, indeed, and we would be distinctly remiss if we failed to introduce at least a few of them. After leaving Los Angeles on the Nomads' Special, our first contact with the outer world was a seven-hour stop-over in Dallas, where we brushed what is left of a once luxuriant crop and hied with our henchmen to an effete hostelry, the Baker Hotel. Here we showered and scrubbed to the several signs of the zodiac, and then repaired to the Mural Room. We were not altogether *persona grata* there at first and were shushed no end by the chief shusher, but in due course he detected the odor of petroleum hydrocarbons and we were accepted without further demur.

Near our table, sitting alone, was a good looking chap with whom we quickly became acquainted and in two vibrations of a mud shaker had him over sitting with us. A substantial citizen we found Clarel Mapes to be, and mighty good company withal. Born in Laddonia, Missouri, he is positively weighted down with degrees, and belongs to more scientific societies and fraternities than a distinguished lecturer for the AAPG. He is an engineer by education and profession, is on the board of directors of IPE, and has traveled widely both at home and abroad in carrying on his many and varied assignments. Businesswise he is now secretary-treasurer of the Mid-Continent Oil and Gas Association, and when not so occupied works for his nine-year-old son, Clarel II, in an ambitious project to corner the world's matchbook cover market, but he never knows the minute he may be switched to the collection of bottle tops, birds' eggs, butterflies, or McArthur buttons.

One of the first men we bumped into at the Exposition proper was Charlie Potter of Richmond Petroleum, Bogota, Colombia. He and Mrs. Potter were vacationing briefly in the U. S., but by this time are probably back in Bogota resting up from their vacation in the U. S., if you get the point. Charlie tells us that there is excellent fishing at the mouth of the Magdalena on the Colombian coast and that the waters literally teem with barracuda, tarpon, kippered herring and filet of sole. A few steps farther along we met Mr. and Mrs. Gail Akin, from the Iraq Petroleum Company, Quatar, on the Persian Gulf. They were enjoying their first leave in 3½ years and expected to depart from Tulsa any minute for Colorado and thence to California, where it is sunshine all the time (says he, ducking swiftly). Mrs. Akin said that when she first arrived in the U. S., she actually got down on her knees and patted the grass, it looked so beautiful after a 10-year diet of desert sand. She also advised that Quatar now has a moom pitcher show and is growing more

like New York every day. Our next greeting was from Red Bradley, vice president of Bovaird, stomping with impatience to get off to Aransas Pass for some deep sea fishing, and candidly confessing that so far as golf is concerned he probably has the best equipment and the poorest performance of any man in Texas. Down the row we talked with Benny Greenwald, Bethlehem's manager of machine sales at Tulsa, and said to own the finest rumpus room in the city. Benny collects guns, postage stamps, and current American coins, but says he can never get quite enough of the latter to suit him. He has a mountain retreat in the Ozarks to which he devoutly wishes he could retreat oftener.

George Failing, president of the firm that bears his name is a broad-shouldered, curly-haired, pleasant appearing chap from Enid, Oklahoma. He loves noisy sport clothes, and is especially fond of ties with dots in them, shirts with stripes in them, and envelopes with checks in them. Altogether he is a very friendly individual, and is a violin virtuoso to boot. In fact, his first job was playing the violin in a Tulsa movie house. He has always been good at it. Even when he was just a little boy you could tell at once whether he was tuning up or playing a piece. He also dabbles faintly in oils, paints, that is, but his greatest diversion is his grandchildren, 14 of them, who are just as crazy about their grandpop as he is about them.

Emory Heuston, publicity director of Bucyrus Erie, from South Milwaukee, is president of the local chapter of SPEBSQSA, Inc., which as nearly as we can remember is the Society for the Preservation and Encouragement of Barber Shop Quartets in America. Incidentally, this organization had its birth in the oil business, the founder being Owen Cash of Stanolind, a well known Tulsan. Owen is now Permanent Third Assistant Temporary Vice Chairman of the quartetters, an imposing title that he will hold as long as he lives. The title dies when he does and we sincerely hope that in the meantime nobody gets lockjaw tinkering around with it.

From Abilene, with his lovely blond wife, came Reese Jones of the Wickwire Spencer Division of Colorado Fuel and Iron. He is reputed to have bought one of the big Bucyrus Erie engines that were on display.

Then there was Buck Shaunty of Varec, from Houston, Texas, fresh water fisherman and hunter extraordinary, especially bear hunting. We asked him if he ever had any narrow escapes, "Nope," he replied, "If there's been any narrow escapes, the bears had 'em."

At the Nomad cocktail party we ran into Jim Moon, the Waldrip fly caster from Hollydale, California, accompanied by Bill Waldrip of Waldrip and Campbell, Barcelona, Venezuela. Bill drives a golf ball farther than Babe Didrickson—in fact, that's the only thing he doesn't like about golf, after he hits the ball he has to walk so far to hit it again. With the same group was Ray Conger, another Venezuelan from Caracas, where he is employed by the Axelson Manufacturing Company. Ray instituted the first manufacturing repair service in S. A., and likes it so well down there he has no great yen to return to the States for keeps.

Woodie Pyeatt, from Weatherford, operating out of Kilgore, where he is a part of the Paraffine Melting Service, tells us he is a brother of Aubrey "Red" Pyeatt, the Angeleno. Like Red he also likes to play golf, and is rather proud of the fact that recently in the same game he broke par and the clubhouse window.

Ed Pool, Black, Sivalls and Bryson, from Odessa, confesses to a domino mania. Probably one of his ancestors was a statistician, and he inherited the bent for putting things end to end.

Russ McIntyre, New York manager of Baker Oil Tools, was born and raised on the Belridge lease in Kern County, California. He loves to sing in the shower and can miss a golf ball with greater force than many men twice his size.

Dee Cant, eminent Tulsan, used to work with Stanley Minor, the Regan Forge whiz, way back years ago. Thinks Stan is tops, too. Dee gets his fun out of leather tooling—makes beautiful belts, purses and things, and gets a lot of help from his wife, Eve, who is also artistically inclined. In fact, to say that the Cants are not accomplished would be sheer cant. Whoops, my dear!

Had a nice visit with Stan Minor and his good lady, Helen, up at the Regan Forge headquarters in the Bliss Hotel. Stan is vice president in charge of engineering for the Regan firm, lives in Whittier, and is a pretty swell fellow in all respects. He


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New 2½" to 4" RIDGID 4P
has balanced loop handles
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● Want a geared die stock you can handle easily when it's greasy and you're tired? Here it is, the rugged new steel-and-malleable 4P. Those sensible loop handles make it easy to pick up, carry, put on pipe. Mistake-proof workholder sets to size *before* you put it on pipe, one screw to tighten, no bushings. Twin-anchored pinion in oilless bronze bearing . . . enclosed gear . . . safe . . . dirt-proof. Four sets of 5 dies. Ratchet handle —RIDGID universal drive shaft for power. A real worksaver — ask your Supply House.

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is of the inventive type and is everlastingly tinkering with new gadgets—a lot of his patents are being used under license by various manufacturers. He was a pioneer in the API standardization program, and is an old time buddy of C. C. Scharpenburg. Stan and Helen both love to potter in the garden, and declare there are many worthwhile lessons to be learned from flowers. After dinner speakers, frinstance, should note that the California poppy always shuts up when the sun goes down. Isn't that interesting?

A brief but pleasant exchange with Angus Stewart, Kuwait Oil Company engineer, developed the fact that he spent some 18 years in Persia, but now lives permanently in New York, where he is concerned with purchases and supply for Kuwait.

Harold Godschalk, from Enid, Oklahoma, the daddy of the Failing core driller, and advertising manager of the company, is one of the oil industry's better public relationists. He has crashed both *Life* and *Fortune* with institutional stories, which, as any scribe will tell you, is a sizeable accomplishment. Fishing is his diversion, but he spends more time fishing for an opportunity to fish than fishing for fish, which is a bit repetitive, but it says what we mean.

Lee Flood, chairman of the Goldsmith Pool Engineering Committee, with Mrs. Flood and Mike, did the Exposition in style. Lee is an active Kiwanian, and devotes his spare time to the production of theatricals, particularly an annual minstrel show, a minstrel show being one in which the end man says, "White chickens is bes' 'cause dey's so easy to find, but black chickens is bes' too 'cause dey's so easy to hide when you've found 'em."

Dutch Slaughter, Tropical Oil Company's drilling superintendent, popped into the IPE for a quick look, but was leaving by boat for the job at the end of May. Dutch, by all accounts is one of the most rugged poker players ever to hit Bogota, which, after sitting in a game with some of the less rugged Bogotans, we are willing to concede is quite a reputation. Another visitor from the same camp was Bob Moyer, engineer with IPC, and ex-Peruvian who is now with Paul Lambright, executive vice president of Tropical and IPC up in Toronto. Bob thinks the Canadian northwood hunters are the most uncommunicative people in the world—some of them only open their traps once each winter.

Bart Meyers, daddy of all the S.A. delegates, started his foreign service in Venezuela and then transferred to Colombia. He was recalled to Toronto in 1933, and is now vice president in charge of oil operations for Standard of New Jersey, by which he has been employed for a meager 45 years. Bart is an honorary member of Nomads, and when he retires soon intends to live in the Mayo Hotel at Tulsa. He is a top bridge player, but was patriotic enough to give it up during the war—because of the rubber shortage.

Had an interesting evening with Bill Heater, the nomadic Baroid executive, who specializes in hotel suites, and one of his Mid-Continent cohorts—George Moore, a likeable sort of a lad. Bill is one of the best conversationalists we know, and a seance with him is always bound to be both enlightening and entertaining. His great ambition at the moment is to see fruit on the Macadamian nut tree that he planted four years ago. It is a native of Hawaii but appears to be a bit more reticent than some Hawaiians we have known.

From Midland came Joe Chastain, engineering rep for Bethlehem Supply Company, and an erstwhile polo player for the University of Oklahoma. We hope Joe will forgive us but the most fragrant definition we have heard for polo is that "it is just ground hockey with fertilizer."

It was nice to see Frank John again, the singing vice president of Mid-Continent Supply Company from Fort Worth, with whom we first became acquainted at the AAODC convention at Long Beach last year. Frank contributed some luscious chords to the impromptu quartet at the cocktail party, consisting of Puny Blevins, the Larkin Packer Company impressario, Ralph Clemons, the Bethlehem Supply baritone from San Gabriel, and Cy Perkins, Chicago rep of *The Petroleum Engineer*, and a world's champion harmonizer. Cy just recently returned from California where he judged the preliminaries for the national SPEBSQSA contest—to take place in Oklahoma this month.

By Chester Immel, district manager of the National Tank Company at Corpus Christi, we were informed that Aransas


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Lightweight: 500 to 3000 watts

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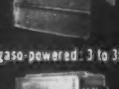
Diesel Plants: 2½ to 35KW

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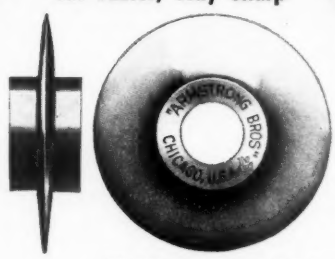


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offers the best fishing and hunting in the U. S. Chet said he doesn't do much deer hunting but often attends stag parties. Guy Williams, the Dowell public relationist in Tulsa, on the other hand, organizes a deer and elk hunting foray into Colorado and Wyoming every fall. Last year he shot four bucks—in a penny ante game.

Bob Brown, McCullough Tool Co.'s lab man in Houston is an expert swimmer, and here we have been hanging around pool halls all our life and can't swim a stroke.

Along the IPE alleys we ran into J. B. Wood, the president of Totco, with Pete Peters and Taylor Bannerman, all looking pleased with themselves. "J B", the inventor of an electronic photographic flash light among other things, has another new bit of apparatus all ready to go to press and we have an invitation to check upon it, so watch this space! Speaking of cameras, Wally Gilbert, Shell Oil Company exec, was much in evidence at the show, sporting a dual exposure gadget about the size of a steamer trunk. It seemed to be two cameras locked together with a brass strap, and was big enough so that if you got tired waiting for a subject, you could practice tightrope walking on the brass strap in the meantime. The way we hear it, Wally is now making a reconnaissance tour of American oil fields and will return to Holland later. Wish he would look up our friends—the Dykes of Holland.

While perambulating through the Hall of Science, our chief —Ken Sclater, suddenly swooped down on a young chap who was taking photos of the exhibits and immediately they launched into an exciting duet in Burmese. We knew at once they were talking Burmese because that is the only language we don't understand—and we certainly didn't know what they were saying. Fortunately, the young fellow was no slouch when it came to speaking English and we have a vague understanding of that. We discovered that he is Maung Thein Nyun, of Moulmein, Burma, now attending the University of Tulsa on a State scholarship. Of 40 students sent here, he is the only one to be assigned to a petroleum engineering course. He is a graduate of the University of Rangoon and has been four years with the Burma Oil Company—two years on a geophysical prospecting party, and two as a research physicist. He is an expert in the Burmese game of chin-lon and his hobby is photography. He speaks English as clearly and lucidly as an Oxonian professor, and we certainly wish him the best of luck as he pursues his studies.

And, lest we forget, we started out one night to call on Mac Carlisle of International Cementers, only to find that he had gone calling. However, we spent a right pleasant hour or so with Jack Smith and Ben Hilliard. Jack has traveled very extensively during the past few years—has been in practically every European country, and only recently completed two trips to South America. He is a graduate of Montana University. Came to California after the famous Dempsey-Gibbons fracas at Shelby, and looks as if he could maybe go a round or two himself if it were necessary. He is a Monday morning quarterback, and his favorite occupation is attending oil men's conventions, particularly, he says, when they are as good as the IPE. Ben Hilliard makes his headquarters in New York, where he represents Byron Jackson, Patterson-Ballagh, and International Cementers. His favorite diversion is entertaining foreign visitors. He is a member of a famous New York golf foursome—Hilliard, Eichler, Landgraff, and Olesen, but he neglected to state what they are famous for. Anyway, to both Jack and Ben we can say this: If they entertain the rest of the foreigners as effectively as they did us, the foreigners should have no complaint.

J. C. "Kobe" Coberly, H. K. Browning, Ray Elner, et al, brought Ed Badger all the way from Los Angeles to take our photo with a Free Pump, but our exuberance over the honor was somewhat dampened by the later discovery that the word "free" had nothing to do with the cost.

And just before we conclude, a word of thanks to Dick Guiberson and his indispensable man, Ed Embury, for an evening of unalloyed bliss in their suite at the Bliss. There we ran the gamut of human entertainment all the way from poker to poetry, and enjoyed every minute of it. Dick has written a piece on Columbus that should be published—it is too good to lock away in a trunk. And, to show the diversified talent of the man, he can hold a little pair so tightly to his chest you would actually think he was in possession of four aces.


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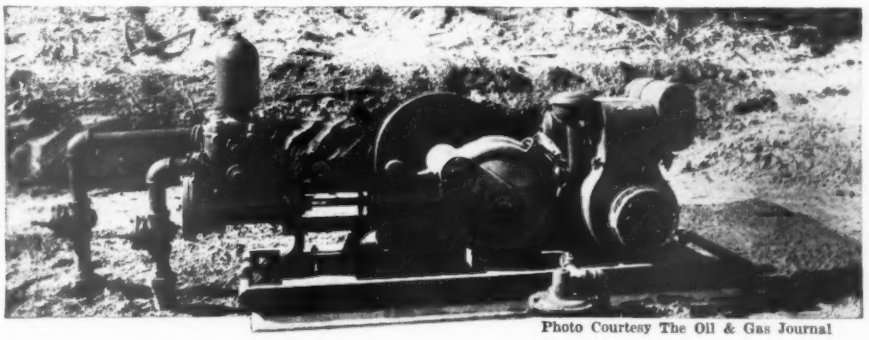

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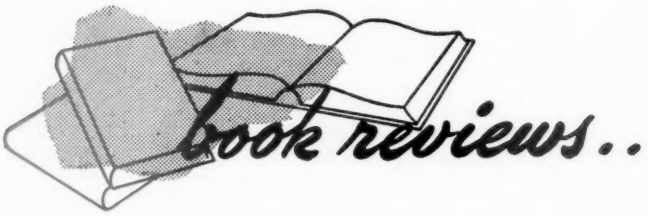



• **The Examination of Fragmental Rocks,** *by Frederick G. Tickell. Stanford University Press, Stanford, California. Pages, 154. Price, $4.*

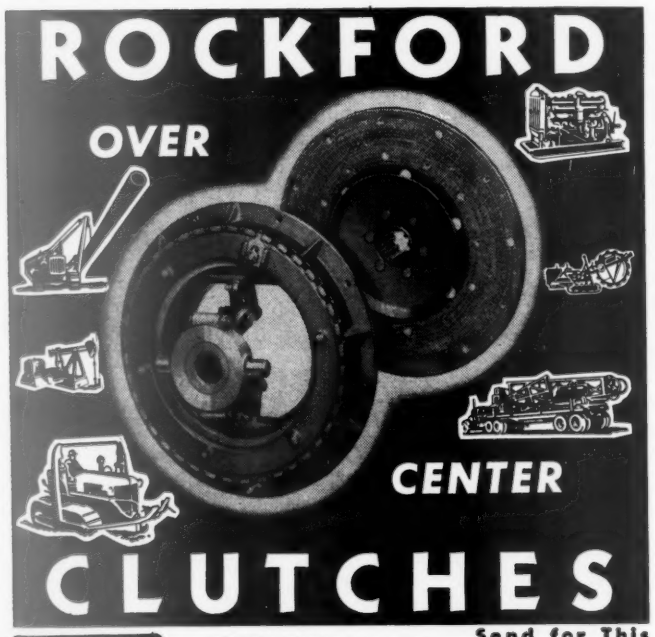
This revised edition treats both of the bulk and grain properties of sedimentary formations, with an outline of the physical properties of fragmental aggregates and of their mineral constituents. The book is not elementary but is readily followed by one who has had the ordinary scientific fundamentals.

The mineral tables present a dichotomous classification making for comparatively simple and rapid identification of the species commonly found in clastic mineral aggregates. Porosity and permeability of porous media was rewritten because of the great interest shown by geologists and petroleum engineers. The bibliography was revised and brought up-to-date. This volume will serve as a laboratory manual and guide for students, geologists, petroleum and chemical engineers, microscopists.

• **Exploration for Oil and Gas in Florida,** *Information Circular No. 1, by Herman Gunter. Florida Geological Survey, Tallahassee.*

A mimeographed report is out which should answer most of the questions on exploration in Florida, and make a ready reference book. It gives a clear picture of drilling and production in this state, including a map.

Tabulation of the 191 wells drilled for oil and gas is arranged alphabetically according to counties. Data for each well includes: (1) Company or owner, (2) farm or well name, (3) location, (4) elevation, (5) year completed, (6) depth, and (7) remarks.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## Stewart and Stevenson meeting

**At an important sales meeting held in Houston June 25 and 26, Joe Manning, general manager of Stewart and Stevenson Services, announced that this company was (1) starting a concentrated drive to make Stewart and Stevenson Services the nation's largest distributor of Continental Red Seal engines, (2) announced the company's appointment as Texas distributor of Packard marine engines, and (3) announced the manufacture of a new Stewart and Stevenson overhead irrigation system. Left to right, front row: H. A. Trotter, Houston sales; L. L. Howell, Wichita Falls branch; J. C. Brown, McAllen branch; Joe Manning, Houston; Fred Malley, Livingston sales representative; W. B. Muse, Dallas. Back row: Emmett Dobbs, Houston; F. W. Smith, Dallas; Bob Mitchell, Houston; R. N. Conolly, Corpus Christi; A. B. (Dick) Grant, Laredo; Charles T. Ames, Houston; J. C. Manning, Houston. Also present at the meeting but not shown in the photograph were: C. L. Ward, Dallas; N. N. Elkins, Corpus Christi; Bill Collett, McAllen; Dick Morrison, Beaumont, and E. E. Childress, Houston.**

## President National Carbide

J. Carl Bode, formerly operating manager, has been elected president of National Carbide Corporation according to a recent announcement. Bode succeeds L. A. Hull who becomes chairman of the board of directors.

Bode, a graduate of the University of Wisconsin, joined National Carbide in 1928. In 1935 he was appointed superintendent of the Keokuk, Iowa, carbide plant. In 1941 he was appointed works manager at Louisville, a position he held until 1945 when he went to New York as assistant operating manager. In 1947 Bode was appointed operating manager. Approximately one year later he was elected president.

L. A. Hull, the new chairman of the board of directors, had served as president of National Carbide Corporation since 1941. Prior to that, Hull, who joined the Air Reduction organization in 1917 had served with National Carbide as sales manager and later as vice president.

## New sales organization

A new sales organization, Chemical Pump and Equipment Corporation, with offices at 75 West Street, New York City 6, has been formed to represent manufacturers specializing in chemical processing equipment.

Officers are Robert T. Sheen, president; John W. Welker, vice president; Paul C. Flucke, secretary; John J. Smith, treasurer. Personnel includes A. W. Lubbers and Ted J. Zeller, sales engineers, and Robert Cohen, office manager.

Accounts presently represented are the Milton Roy Company of Philadelphia, manufacturer of controlled volume chemical and high pressure pumps, automatic chemical feed systems, and boiler water chemical treating systems.

## Executive vice president Girdler

The members of the board of directors of The Girdler Corporation, Louisville, Kentucky, have elected W. Roberts Wood executive vice president of the organization.

Wood was born in Louisville and received his degree of bachelor of chemistry at Cornell University. He was associated with DuPont in the East before joining The Girdler Corporation on November 1, 1929. He was placed in charge of the firm's Gas Processing Division on October 1, 1938, and on June 20, 1941, he was elected vice president.

## Clardy to Indiana Standard

Appointment of Bruce C. Clardy of Tulsa, Oklahoma, as general manager of crude oil supply and manager of the products pipe line department of Standard Oil Company (Indiana), with his office in Chicago, is announced by Frank O. Prior, vice president in charge of production. The appointment became effective July 1.

Clardy has been president of Stanolind Pipe Line Company since 1946. In 1943 and 1944 he served as assistant director of supply and transportation for the Petroleum Administration for War. His specialty was direction of crude oil allocations to refineries as well as purchase and sale of crude and products carried by the Big Inch and Little Inch pipe lines.

Clardy is a native of Texas and was educated at the University of Texas. He served with the marines in World War I. His career in the oil industry began with oil field work in Augusta, Kansas, in 1916. Later he became a roustabout for the Jackson Company of San Antonio, Texas, and rose to superintendent. In 1926 he became supervisor of the oil and gas division of the Texas Railroad commission.

From 1928 to 1936 he was with the Shell Pipe Line Company as district gauger and pipe line foreman and later as manager of the crude oil department. He then went into drilling and producing operations for himself, with the firm of Heyser, Heard, and Clardy, Inc. He continued in such operations up to the time of joining Stanolind except for the period in which he was in PAW.

## Du Pont opens refinery laboratories

Two west coast laboratories, to provide technical service to the oil refining industry, were formally opened recently by the Du Pont Company.

Units of the Du Pont Petroleum Chemicals Division, the west coast laboratories, at El Monte, California, include complete facilities for road-testing motor fuel and lubricant additives and for knock-testing and inspecting gasoline.

The road test laboratory is one of two that Du Pont maintains. The El Monte road test laboratory is concerned primarily with testing fuels and additives under heavy transport conditions. A fleet of trucks uses the desert and mountains day and night for their testing ground. The other road test laboratory, using passenger cars, is at Wilmington, Delaware.

The El Monte installation also includes a district service laboratory where refiners can bring to Du Pont technical men day-to-day problems requiring immediate solution. It is one of a chain of such laboratories strategically located throughout the United States to service the oil industry. Others are at Tulsa, Houston, Chicago, and Wilmington, Delaware.

Top administrative, production and technical men of California oil companies inspected the El Monte facilities at an "open house." The technical staffs of the laboratories are headed by Iver T. Rosenlund, manager of the road-test laboratory, and Kenneth C. Edson, manager of the district service laboratory. They, with David H. Conklin, west coast sales manager of the petroleum chemicals division, were hosts for the occasion.

Technical services of the Du Pont petroleum chemicals division are headed up by J. R. Sabina, director; J. J. Mikita, director of the combustion engineering laboratory and E. L. Korb, director of the petroleum chemicals laboratory.

Establishment of the district laboratories a few months ago was one manifestation of the entry of the Du Pont Company, manufacturers of tetraethyl lead for 24 years, into the business of marketing the antiknock compound. In effect, Du Pont officials pointed out, the laboratories bring to the major refining regions of the country the knowledge and facilities of the company's entire research organization.

## Lane-Wells sales convention

More than 60 Lane-Wells sales engineers and operating superintendents met for a three day sales convention at the Blackstone Hotel in Fort Worth, Texas June 7, 8, and 9. Under the direction of Jas. D. Hughes, sales manger, reports of company activities from all divisions were made, and discussions of forthcoming services and products were explained to the sales personnel.

Morton T. Higgs, manager of field operations, gave a complete report on new field equipment. Val L. Forsyth, assistant chief engineer, outlined improvements and developments on equipment and products.


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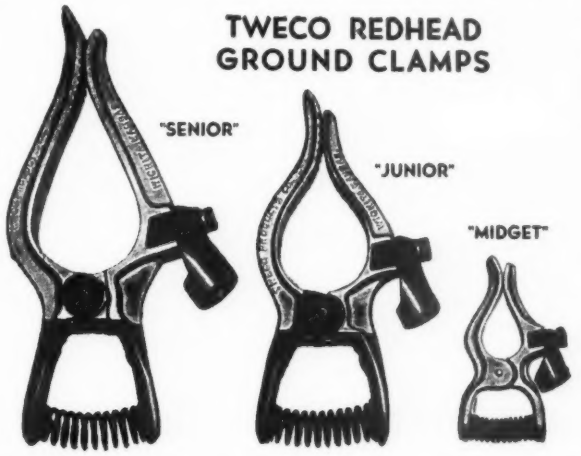


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